HOTEL PURITAN.

SIXTY-NINTH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CVIII. NUMBER 15. ★ NEW YORK, APRIL 12, 1913. ★ [PRICE 10 CENTS $3.00 A YEAR

HOTEL PURITAN.



Wreck of a train at Yost, New York, caused by the flooded Mohawk River. The passengers were rescued with difficulty.



Transportation by boat in First Street, Troy, N. Y., when the Hudson River invaded the city.

THE RECENT GREAT FLOOD.—[See page 336.]

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Founded 1845

NEW YORK, SATURDAY, APRIL 12, 1913

Published by Munn & Co., Incorporated. Charles Allen Munn, President
Frederick Converse Beach, Secretary and Treasurer
all at 361 Broadway, New York

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Subscription Rates

Subscription one year $3.00
Postage prepaid in United States and possessions, Mexico, Cuba, and Panama.
Subscriptions for Foreign Countries, one year, postage prepaid, 4.50
Subscriptions for Canada, one year, postage prepaid, ... 3.75

The Scientific American Publications

Scientific American (established 1845) . . . . . per year, $3.00
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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

A Problem of National Proportions

THE floods in the upper watershed of the Ohio, with their tragic accompaniment of suffering and widespread ruin, will have carried with them a large compensation if they prove to this nation that the question of the control of the Mississippi River and its tributaries is broader than any State or community and that it must be faced and mastered by the nation at large.

If anyone asks why the Federal Government should be urged to take hold of this problem on a national scale, and assume full responsibility for the time and labor and great cost involved in obtaining complete control of the Mississippi River, surely it is sufficient to remind him that the drainage basin of this great river covers forty-one per cent of the total area of the United States. A line delimiting the frontiers of this area starts on the Louisiana coastline, sweeps westerly through Texas, and then northwesterly through New Mexico, Colorado, Wyoming, Idaho, and Montana; swings across the Canadian border line to re-enter the United States in North Dakota; then passes on its easterly bearing through South Dakota, Minnesota, Wisconsin, northern Illinois, northern Indiana, Michigan, Ohio; and even swings into New York before it passes on its southerly bearing through Pennsylvania, Virginia, North Carolina, Georgia, and Alabama, and finally reaches the Gulf again through Mississippi and Louisiana.

If we except the arid regions, every square mile of this vast territory contributes its quota, be it large or small, to those floods which, with persistent regularity, overflow the twenty million acres of land which lie between St. Louis and the Gulf.

True it is that some of the floods, such as that which a few weeks ago devastated the upper valleys of Ohio, and is to-day threatening the lower regions of the Ohio and the Mississippi, are comparatively local in their origin and effect; but this merely points the moral that any adequate treatment of this stupendous problem must be based upon the broadest kind of a survey of the whole situation, in which every possible agency which may be contributory to disaster is investigated.

The drainage basin of the Mississippi River covers 1,240,050 square miles, and of this total the Missouri basin covers 527,150 square miles; the Ohio basin, 201,700 square miles; the Arkansas basin, 186,300 square miles; and the upper Mississippi basin, lying above the junction with the Missouri River, 165,900 square miles. In the Red Basin are 90,000 square miles and the Central Valley, lying between the Missouri River and the Gulf of Mexico, covers 69,000 square miles. Although the Missouri basin is by far the largest, it is comparatively a dry region, and its rainfall is moderate. The Ohio basin constitutes the zone of heavy precipitation, and although in area it is less than half as great as the Missouri basin, it contributes about three times as much water to the Mississippi River during the year. Moreover, there is apt to be a wide difference in the various basins between the rainfall and the run-off. The Missouri basin, for instance, where the soil is sandy and highly absorbent, and the winds are dry, delivers a much smaller percentage of its rainfall to the main river than does the surface of the Ohio Valley. Thus the Missouri has an annual rainfall of 19.6 inches and a run-off into the river of but 12 per cent of this. Of its annual rainfall of 34.7 inches the upper Missouri delivers but 27 per cent to the river. The Ohio basin, on the other hand, with an annual rainfall of 43 inches, delivers 30 per cent of this into the river.

It will be readily understood from the above comparison that if the levees in the lower regions of the river are to be assisted in their work of keeping the flood within its banks by a system of reservoirs at the head waters, the most promising field for investigation is the upper reaches of the Ohio, and its tributaries. It is, of course, doubtful if any system of control of this kind could cope with such a four days' rainfall as caused the recent floods; but it might greatly mitigate disaster, and it is for the Federal Government to undertake immediately the necessary surveys to determine what can be done along these lines.

That the rapid denudation of our forests has increased the total volume and the speed of the run-off into the rivers during heavy rains, cannot be disputed. This suggests that any movement for Federal action should receive the hearty co-operation of the powerful interests which are working for forest preservation and for the reforestation of denuded lands. Also, if the Government investigation should show that reservoir construction would materially assist in Ohio and Mississippi flood prevention, the Reclamation Service should prove to be a powerful factor in the new movement. Furthermore, this would be the time to draw up a definite policy with regard to the preservation and control by the Nation of its water powers.

If ever there was a great National undertaking which called for intelligent co-operation and thorough organization, it is to be found in the control of our greatest river.

Above all, Congress should avoid hasty and ill-considered action. The problem should be considered from the broadest national standpoint; and the final plan should be agreed upon, only after this great question has been viewed from every possible standpoint and submitted to the highest technical investigation.

Finally, whatever may be done, let it never be forgotten that by far the most important and pressing obligation is the completion, as early as is physically possible, of the system of levees and revetments throughout the full length of the rivers affected.

The Thousand-foot Ship

NOT so very many years ago, that distinguished naval architect, the late Sir William White, surprised the world by stating that if the conditions of transatlantic traffic called for a 1,000-foot ship, it would be perfectly practicable to build and operate a vessel of that size. Few of us at that time dreamed that there would ever be a call for such a huge vessel; yet so rapid has been the development of transatlantic travel, and so industrious have been the dock and harbor commissioners on both sides of the Atlantic, that not only is accommodation in the way of channels and piers being made ready for such a ship, but thanks to the enterprise of the steamship companies, the 1,000-foot ship is within sight. The launch of the "Vaterland" (formerly known as the "Europa") for the Hamburg-American Line has carried the transatlantic liner up to within fifty feet of the thousand-foot limit suggested by Sir William White as a remote possibility. If we remember rightly, his statement was made at the time of the appearance of the White Star liner "Oceanic," the first ship to exceed the length of the "Great Eastern" (692 feet) and the first to exceed the limit of 700 feet. Since her appearance the progression has been rapid. She was followed by the "Adriatic," 725 feet over all; the "Lusitania," 790 feet; the "Oceanic," 882½ feet; then by the "Imperator," 920 feet; and now by this 950-foot ship. A third vessel is building upon the docks at Stettin. She is to be larger than the "Vaterland," and if her length is increased only by the freeboard of the "Vaterland" at her stemhead, this ship will have the distinction of being the first 1,000-foot vessel.

Frequently the question is asked, what is the limit of practicable size? How big will be the liner of ten or twenty years hence? In reply it can be confidently said that the physical limitations are those only of the depth of our entrance channels and the length of our harbor piers. Judged from the economic standpoint, from the point of view of revenue earning for the steamship companies, there is every inducement to build these transatlantic liners in ever-increasing sizes; provided of course that the speed be maintained within reasonable limits. It may be broadly stated that the larger the ship, the less the cost of carrying a given number of passengers and a given tonnage of freight. The same principles which have led our railroads to build 50-ton cars and 300-ton locomotives encourage our shipbuilders to produce vessels 1,000 feet or more in length.

Why We Need an Aerial Navy

EVER since the record 31-hour flight of the new German naval Zeppelin airship on October 13th and 14th, 1912, in which, by the captain's own admission, the airship traveled a distance of 1,067 miles, the British military authorities have been greatly agitated. At about 1 A. M., on the morning of October 14th, 1912, a large dirigible was seen over Sheerness, the military outpost near the mouth of the river Thames. The airship is known to have traveled to the island of Heligoland, in the North Sea, and thence along the German coast, after which it circled back to Berlin. Notwithstanding that the weather was foggy, the captain was in communication by wireless with various points in Germany throughout the entire voyage and was able to calculate his position from his known speed and from the direction in which he traveled. Besides carrying fuel enough for a 50-hour flight, the airship had an extra lifting capacity of two tons available say for ammunition. As there is no longer any doubt about the havoc that can be wrought by bombs dropped from aeroplanes and airships, the British War Office was greatly stirred by the reported appearance of this airship, and England's Minister of War has set to work in serious earnest to secure a suitable air fleet for the Island Kingdom.

The descent, on April 3rd, after a flight of some seven hours from Friedrichshaven, of the latest German "Zeppelin IV." on the parade ground at Luneville, France, as a result of its becoming lost in the clouds at a height of some 10,000 feet, affords further proof how easy it is for an airship to start in one country and land in another.

The announcement of a prize of $50,000 by the *London Daily Mail* for the crossing of the Atlantic in an aeroplane within 72 hours has brought to the attention of the American public the possibility that a modern Zeppelin might cross the ocean and attack this country in time of war. The latest Zeppelin airships with four motors are credited with a speed of 60 miles an hour in still air, and if one of these reached the altitude in which a favorable wind was found, it could probably cut several hours off this time. This would mean that after crossing the ocean inside of a day, the airship could attack cities such as Portland, Me., or Boston, Mass., and return across the Atlantic without replenishment of fuel. It would be an easy matter, however, to have warships convoy the airships and carry the necessary supplies of fuel and ammunition. The refueling of a Zeppelin from a collier has been accomplished several times in the North Sea without any difficulty.

Now that both the army and navy of the German Empire have ordered twenty huge Zeppelins and ten Schutte-Lanz dirigibles, it would be well for Congress to consider whether it would not be wise to undertake the construction of a dirigible of large size for experimental work, and make a generous appropriation for an up-to-date aeroplane fleet. During the last five years Germany, France and Russia have spent $28,000,000, $22,000,000, and $12,000,000 in the order named for aeronautics. Italy, Austria, and England have spent eight, five, and three millions; Belgium, two; Japan, one and one half; and Spain, $550,000, whereas in the United States of America, only $435,000 has been expended, and we have to-day less than a score of aeroplanes and one out-of-date dirigible, as against the large and efficient fleets owned, respectively, by France and Germany.

Potash Fertilizer and Frost

EXPERIMENTS made in France by W. Golte show that potash fertilizers have the property of protecting crops against damage from frost. In order to show what results are obtained in different cases he proceeds as follows: Three areas of a quarter of an acre each were sown with rye. The first area did not receive any fertilizer, and on the second and third there was spread 260 and 130 pounds, respectively, of the fertilizer known as "kainite." After a period of heavy frosts it was found that the ground of the area which was strongly fertilized had not been frozen. The second or less fertilized area was much less frozen than the untreated field. The author considers that this effect is no doubt due to the saline solution at the surface of the soil. However, he finds that the sprouts on the strongly treated area were less flourishing than the others, and the leaves seemed to have lost a considerable percentage of water by plasmolysis. But during the thawing period, the pathological symptoms disappeared and the plant showed a rapid and vigorous growth. On the contrary, on the non-treated area the effects of the frost were shown by a yellowing of the leaves. As is known, the damage caused by freezing is due to the fact that the water contained in the inter-cellular spaces destroys the tissues by a tearing action due to alternate freezing and melting. The fertilizer temporarily removes a great part of the water from the plant, and thus has the effect of diminishing this action.

Engineering

The Loetschberg Railroad Completed.—By this time trains should be running over the Loetschberg railroad, which joins Berne with Brieg, the last rail having been laid on the 28th of February. This road opens a new highway between the north and south of Europe by way of the Loetschberg and Simplon tunnels across the central Alps. By the new route the distance from Calais to Milan will be 675 miles, which is shorter by eighty miles than any existing route.

A Record Spring Test.—During the course of some recent tests of locomotive spring steel made of vanadium steel, a fiber strength of 256,000 pounds per square inch as the elastic limit was developed. This, as far as our knowledge goes, constitutes a record for locomotive spring steel. Carbon, oil-tempered springs showed an elastic limit of 101,000 pounds; chrome-nickel, spring-tempered springs, an elastic limit of 134,500 pounds, and the chrome-vanadium oil-tempered springs showed a limit of 256,000 pounds.

Battleship with Four-gun Turret.—Multiple-gun turrets are certainly in favor just now; for the French authorities have decided to adopt four guns in each turret for their four ships of the "Normandie" class, which are to be laid down this year. There are three turrets, one forward, one amidships just abaft the smokestacks, and one on the quarter-deck. These ships are 574 feet long, 87 feet 7 inches broad, and displace 25,200 tons on a 28-foot 4-inch draft. The armament consists of twelve 13.4-inch guns and twenty-four 5.5-inch guns. The armor belt is 12½ inches in thickness.

Panama Canal to be Rendered Impregnable.—As a result of the visit of the members of the House Naval Affairs Committee to Guantanamo, Cuba, and Panama, it would seem that the members are in favor of rendering the canal impregnable, and placing a garrison at Panama of sufficient strength to prevent a hostile force from making any attack upon the canal throughout its entire length. Col. Goethals stated before the House Military Committee last January that a garrison of 25,000 men would be needed for this purpose. This is a large force; but when we consider the magnitude of the interests involved, it does not seem to be excessive.

Satisfactory Solution of a City Nuisance.—The successful introduction of electric traction for the suburban service of railroads, as exemplified in the electrification of the New York Central and New Haven railroads, has led to the formulating of a proposal for electrifying the New York Central freight tracks from the northern limits of the city down to 72nd Street. This will give to the New York Central Railroad a better service, and will solve the problem of the smoke and noise nuisance which is occasioned by the present open tracks of that railroad along the shoreline of Riverside Park, New York. The Board of Estimate of this city has arranged with the New York Central Railroad to place its tracks in a subway, the surface of which will be formed into a broad driveway, the space between the tracks and the river being turned over to the city to be laid out as a part of the Riverside Park system. The tracks will be operated electrically.

Continued Sliding at Culebra Cut.—On the night of March 12th to 13th the break in the east bank of the canal, opposite Culebra, which first moved its bank on the night of February 5th, again made another rapid movement downward and toward the canal. The bottom of the canal, according to the *Canal Record*, was heaved up for a distance of about one thousand feet, to a maximum vertical height of about thirty feet, destroying five tracks in the bottom of the canal, and leaving only one track in commission. The canal engineers are not dismayed, and they have already placed steam shovels at work removing this material. Later when the water is turned into this section of the cut, the two new floating dredges will be placed in service and they will remove material at the rate of one million three hundred thousand cubic yards per month.

Columbus and the Panama Canal.—It is stated that the three models of Columbus's ships, built in Spain and sailed here and exhibited at the World's Fair at Chicago in 1893, are to be exhibited at the Panama-Pacific Exhibition in 1915. If the plans are carried out, the little craft will leave Chicago, pass down the Mississippi, through the Gulf of Mexico, and so through the Panama Canal and up to San Francisco. There is something very appropriate in the suggestion; for it was in the search for a westward passage to India that Columbus set out on his classic voyage. On the last of his four voyages, he reached the Isthmus of Panama, and his name is commemorated at Colon. The vessels made the passage over the stormy Atlantic Ocean and it is not asking too much that they should cross the Gulf of Mexico and sail up the western coast to San Francisco, always supposing that they have been maintained in good repair during their long sojourn at Chicago.

Aeronautics

$50,000 for a Trans-Atlantic Aeroplane Flight.—The *London Daily Mail* has just made an offer of $50,000 for the first aeroplane which shall fly across the Atlantic Ocean in either direction in 72 hours time. The flight must be made between England or Ireland to or from any point in the United States, Canada or Newfoundland. This prize is international and may be competed for by all aviators throughout the world. It is permissible to alight upon the water and take on more fuel if this can be arranged for. About a year ago there was a great deal of discussion regarding the trans-atlantic flight, but now that a real prize has been put up we believe that the flight will be made, if not this year, at least in the summer of 1914. Such manufacturers as Blériot, Herr Rumpler, and Col. Cody have already announced their intention of competing for this prize.

A $25,000 Prize for British Aeroplane Constructors.—The *Daily Mail* has also offered $25,000 for the first aviator who shall fly around England, Scotland and Wales and as far as Ireland, that is, within one mile of Kingstown Harbor, in 72 consecutive hours. The machines are not allowed to descend upon land at any point, but they may stop in harbors for fuel replenishment. They are to be hydro-aeroplanes or flying boats and not land machines. This prize is offered for British constructors and aviators only. These two prizes are the first big sums that have been offered for several years to promote progress in aviation. The Gould prize of $15,000 offered in this country three years ago had but one serious contestant, when the competition was to be held, last Fourth of July. This prize was offered for a two-motor aeroplane, the type of machine which will undoubtedly be needed to accomplish the trans-atlantic flight just mentioned.

Record Flight with a Passenger on the Pacific Coast.—On Sunday, March 23rd, a fast flight was made from Los Angeles to San Diego, Cal., by W. L. Bonney with his Deperdussin monoplane, carrying Miss Margaret Stahl as passenger. The start was made from Los Angeles, at 1:30 P. M., and after a continuous flight of an hour and eight minutes, Bonney alighted at Oceanside. He started from this place at 3:16, and finally landed to the south of San Diego, at 3:56 P. M. He had adverse weather conditions to contend with on the flight and also became confused as to his landing place because of a number of bonfires that were lighted in the vicinity. He was supposed to land beside a huge bonfire at San Diego. As a result of his confusion, he made a bad landing and broke the running gear of his machine. The time of 108 minutes for the 112 miles between Los Angeles and San Diego, makes his average speed for the flight 62.22 miles an hour.

Record Cross-country Flights in Germany and the United States.—By a strange coincidence, army men in Germany and the United States have recently made lengthy cross-country flights and broken all records. On the 30th ult. Lieutenants Canter and Bohmer, starting from Juterbog, near Potsdam, flew across Berlin and Lubeck and as far as Closs in Schleswig-Holstein. They were in the air 6 hours and 9 minutes and covered a distance of 372 miles, thus averaging 60 miles an hour. On March 29th, Lieuts. Milling and Sherman of the Signal Corps Aero Squadron No. 1, flew from Texas City, Texas, to San Antonio, a distance of 237 miles, in 3 hours and 20 minutes, or at an average speed of 71 miles an hour. Upon arriving at the latter city, they remained aloft for another hour, making a total duration record of 4 hours and 22 minutes and breaking the existing American record by 31 minutes. Two days later they flew back to Texas City against a strong wind in 3 hours 50 minutes. They used the new Burgess tractor biplane fitted with a 70 H. P. Renault motor. Both the German and American flights set up new records for cross-country flights with a passenger.

$37,500,000 for a German Aerial Fleet.—The latest plans of the German Admiralty for a huge aerial fleet to accompany the warships have recently been made public. These call for an expenditure of $12,500,000 to be spent during the next five years, while the appropriation for army aviation and aeronautics is to be nearly $25,000,000. In a bill introduced into the Reichstag on March 29th, a large appropriation was made for ten naval dirigible balloons of the largest size, eight of which are to be put in service and two to be held in reserve. To house these dirigibles, fifty-four double revolving balloon sheds are to be constructed. With this new type of shed, the dirigibles can be housed at any time, no matter what the weather. Extra sheds are to be built as a reserve. Fifty aeroplanes (thirty-six for active use and fourteen for reserve) are to be built and are to be manned by a special corps of 1,452 officers and men. The total appropriations for the fleet of aeroplanes and dirigibles to be spread over the years from 1914 to 1918 amount to $8,750,000 for dirigibles and $2,250,000 for aeroplanes, while $1,500,000 extra is asked for paying the aviators and men who man the airships. The life of each of these new Zeppelins is estimated at but four years.

Automobile

An Automobile Lamp Trimmer's Wagon.—We have become familiar with the wagon having a high tower-like frame used by linemen for supplying electric arc lights. Patent No. 1,053,080 is for a lamp trimmer's wagon having an electric motor and controlling means extending into position to permit of its operation from the top of the elevated or towerlike structure.

New Motor Fire Engine for Uerdingen.—A new motor fire engine recently has been delivered to the city of Uerdingen, Germany, and under test an unusual capacity was demonstrated. The apparatus is self-propelled by means of a gasoline motor which, at 1,200 revolutions a minute, develops 75 horse-power; the motor also drives a four-stage centrifugal pump which at approximately 1,700 revolutions a minute yields as much as 500 gallons of water against a head of 360 feet. With nozzles measuring 30 millimeters in diameter, jets of upward of 164 feet in height were obtained, the manometer pressure being 13 atmospheres.

An Automobile that Pulls Itself Out of Holes.—In a patent, No. 1,054,831, to Gay Victor De Peel of Crocker, S. D., there is shown a draft appliance for automobiles, in which a windlass detachably secured to the hub of the rear wheel has a rope connected to it and led forward through a friction guide carried on the forward portion of the automobile, with the front end of the rope anchored at a suitable distance in advance of the automobile so that the engine may operate to wind up on the drum and draw the automobile forward, the machine being suitably guided on the rope by the forward friction guide.

Cooling Pneumatic Automobile Tires.—Andrew B. Craig of Tarkio, Mo., has secured two patents, No. 1,049,677 and No. 1,049,678, wherein the pneumatic tire is cooled by suitable means which operate to secure a circulation of the cooling medium through the tire. The cooling liquid, which may be salt water in summer or alcohol in winter, is circulated by a pump operated from the wheel through an air-cooled radiator and through a cooling tube in the tire in such manner as to maintain a sufficiently low temperature to prevent overheating the tire, thus preventing blow-outs, likely to result from the overheating and consequent expansion of the air in the tire.

Commercial Vehicles in Munich.—The city of Munich is putting in service a number of power wagon vans for transporting wounded horses. Such wagons can also carry eight or ten persons seated, and in order to take in the horse, a platform is swung out from the back end so as to run down upon the ground. The horse is strapped onto this platform and the whole is run into the van by the use of a motor-driven windlass. Means are also provided for conveying the horse onto the platform from the street in the best way. The new Saurer vans are fitted with 30 horse-power gasoline or benzol engines and have single rubber-tired wheels in front and double in the rear.

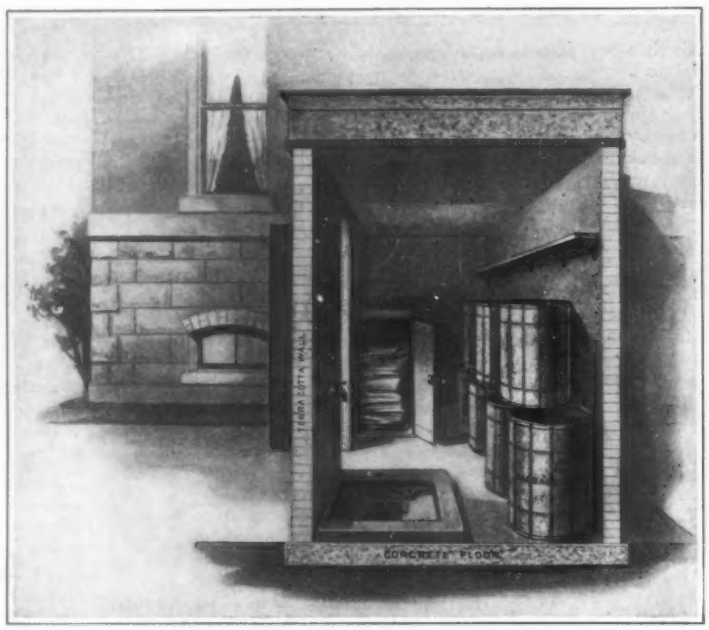
The Four-tractor-wheel Type in France.—A new type of power wagon is making its appearance in France, this being the tractor having all four wheels driven from the motor and acting as steering wheels. Besides the Panhard wagon to which we referred, the Blum-Latil and the Balachowsky are newer ones of like principle. The well-known Creusot works are engaged on the same subject, it is said. It will be remembered that this firm supplied a good part of the autobuses in Paris, with the De Dion company. It is recognized that the army is greatly in need of a good tractor for use with a trailer car or a train of cars. Most of the present power wagons, which are excellent, are designed mostly for separate use with three to five-ton net load, and these are in extensive use in the army and as subsidized private wagons. It is even proposed to hold a separate concourse for new tractors, quite outside of the regular annual military power wagon endurance test, so as to compare the tractors among themselves.

Gasoline in War.—Commandant Ferras considers that the fuel question for automobiles and especially for power wagons is a vital point for the French army, as a large amount of gasoline needs to be imported. From 1910 to 1912 the imports rose from 25,000,000 to 50,000,000 gallons, America furnishing a large part. Home production of fuel is desired, but this is a difficult matter. Among the fuels, benzol has only a limited production, and each country is likely to absorb its own product. Thus Germany produces 200,000 tons of benzol and at the same time consumes 700,000 tons of gasoline. France produces but 10,000 tons and this is not enough even for the autobuses in Paris, which need 16,000 tons. Alcohol is a home product, but it is dear and the price fluctuates by speculators' maneuvers. Chemists are occupied with new products, but we must wait for these. Petroleum or heavy oil, however, seems to have a good future should inventors be able to apply it as well to automobiles as in the Diesel engine. Schist oil is extensively found in France, and there is a good outlook in this direction.

Fireproof Shelter for Refuse Receptacles

IT is very evident that the empty garbage can may be quite as great a menace as the full one, if not properly cleansed and sterilized. And hence the storage of the can is at all times a matter of vital importance. Closely associated with garbage disposal is that of ashes and waste paper. While it does not present a sanitary menace, such refuse matter is dangerous by reason of the fires that it may cause.

To take care of all this refuse matter and the receptacles in which it is contained, an excellent suggestion has been made by Mrs. Flora Speigelberg. She proposes that fire-proof rooms should be made in the cellar or basement of the building to receive the garbage and ash cans. It is essential that such a room be well ventilated. A terra cotta wall, metal doors and windows for ventilation are practically all that is necessary. Of course such a room should have easy access to the street. Where there is no basement, or where the basement is used for storage, a shelter should be built at the back of the building, such as illustrated in the accompanying drawing. The ideal shelter should contain a metal box for papers and also a place for washing the cans after they have been emptied. This idea has met with the approval of the Health and the Fire Commissioners of New York city and of the Chief of the Fire Prevention Bureau. Such shelters, if required by the building code, would do away with fires that are now of common occurrence, due to stowing of paper, excelsior, rags, and other materials near elevator shafts and under wooden stairways.



Fireproof room for garbage and ash cans and waste paper.

Mrs. Speigelberg points to the fact that similar conditions exist under open iron gratings in front of many shops. In front of garages receptacles containing oil soaked rags are frequently left standing without any cover over open gratings under which gasoline is stored, and often wooden boxes and barrels are placed beside these oil soaked rags and papers. Added to the danger of spontaneous combustion is that of the lighted match, cigar or cigarette carelessly thrown into the fire trap.

The Smokestack and the Rudder of the "Imperator"

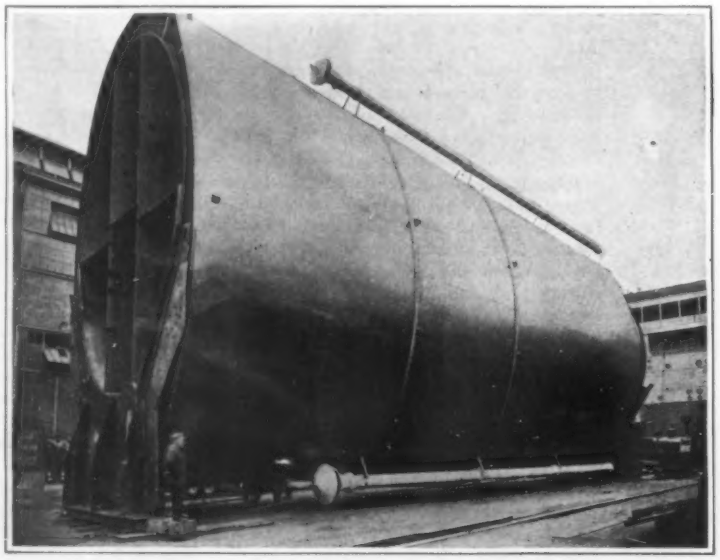
IT is difficult to convey an adequate impression of the size of a huge modern Atlantic Ocean liner by means of photographs or drawings. A mere photograph does not tell the story unless there is some object alongside that may be used as a basis of comparison, and even then it is difficult to grasp the full dimensions of the vessel for the reason that the object with which it is compared must of necessity be enormously large, so large, in fact, that it itself must be compared with a smaller object more within our ken. A better method is to dissect the ship and show certain details of it as compared with smaller and more familiar objects. In the accompanying illustration we show a section of one of the smokestacks of the new giant liner "Imperator." The smokestack is elliptical in section, and the major axis of the ellipse is thirty feet long. The stack would form a tunnel of ample dimensions for a locomotive and train to pass through. Standing beside the section of the funnel is a man, who is completely dwarfed by the bulky steel cylinder. The smokestack of the "Imperator" will extend sixty-nine feet above the deck. Sixty-nine feet is the height of an ordinary six-story house. The rudder of the "Imperator" weighs ninety tons, and the stock on which it swings weighs 110 tons. Despite its enormous weight the rudder will be moved at the delicate touch of a wheel on the bridge nearly a sixth of a mile away. The "Imperator" will have a total length of 919 feet; her sister ship the "Vaterland" just launched, 950 feet long. A complete description of this vessel will be found in the current SUPPLEMENT.

Circassian Walnut

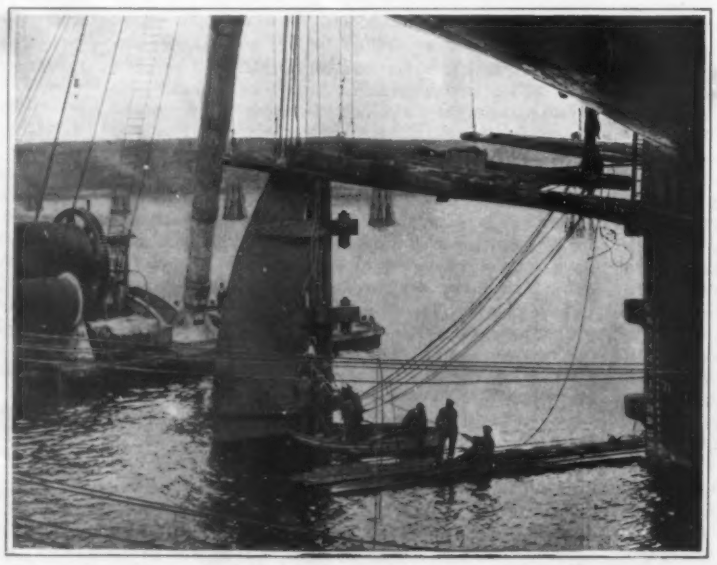
CIRCULAR 212, entitled "Circassian Walnut," is the fifth number of a new serial admirably promising to supply a void in the library of the young forester, as well as in that of the wood user. It is a very interesting and important contribution to the history of the use of one of the best known woods in the world. The subject is discussed in the following chapters: Common names; uses; native and cultivated range; sources of supply; logging and transportation to market; waste in preparing logs for shipment; consumption of Circassian walnut in the United States; gross characters of the wood; minute characters of the wood; substitutes for Circassian walnut.

The trade name of this wood is Circassian walnut, so called because it comes principally from Circassia, which lies between the Black Sea on the southwest and the river Kuban on the north. It is not generally known that this tree is the same as the English walnut, the fruit of which is found in every market. It is now one of the most widely distributed of the commercial timber trees. There is no authentic record as to when Circassian walnut was brought into the United States. Here it has been planted from the Atlantic to the Pacific, the greatest attention having been given to it on the Pacific Coast, where it is grown for its nuts. Since wherever it is grown in the United States it is for this purpose, the wood produced is of little importance.

The Circassian walnut is remarkable not only because its wood is so attractive and valuable that the best grades often bring a higher price than mahogany, but because it grows to a considerable size, and attains a great age. An English writer relates that the architect Scannonzi saw a table made of a single piece from the trunk of a walnut, which was 25 feet in breadth, and of a proper length and thickness. It was upon this board that the Emperor Frederick III. had a splendid entertainment in 1724. The age of the tree was estimated to be about 900 years. Referring to the logging and transportation of this wood and the waste in preparing it for market, this circular points out the alarming extent to which Circassian walnut is approaching exhaustion. It informs the reader that the supply is often very limited, and, in fact, invariably fails to meet the demand. Realizing the importance of a home supply, France passed an act in 1720 prohibiting the exportation of Circassian walnut. In consequence, large numbers of plantations were established throughout England, France, and Germany. Some of these were very extensive; one founded in 1818 near Boulogne, France, contained about 30,000 trees. Nothing new is given in reference to the gross structure and mechanical properties of the wood, but the old facts are presented in language which the layman will easily understand. Another chapter is devoted to a consideration of the structure and composition of the wood, but it is purely elementary and singularly free from technicalities. Substitutes for this wood are also dealt with and the reader cautioned to guard against spurious kinds which now masquerade in the market as Circassian walnut.



A section of the huge smokestack of the "Imperator."



Mounting the 90-ton rudder on the "Imperator."

Urbain's Researches

IN his report upon the work of Prof. G. Urbain of the Paris University, who recently obtained the La Caze prize awarded by the Academy of Sciences, M. Le Chatelier sums up the main points of these researches upon the rare earths, and mentions a number of new elements discovered in this way. During the course of his researches to find the rare elements M. Urbain made more than 100,000 fractional crystallizations. We wish to bring out the new elements which he found in this way, or at least, definitely established. He first isolated the metal *europium* in a pure state and showed its real existence, it being identified with bodies described by Crookes and Lecoq de Boisbaudran, whose somewhat different properties were due to impurities. Next he established that *gadolinium*, which Demarcay had obtained in a pure state, is the same as the victorium of Crookes, this latter having quantities of yttrium with it. The atomic weight of gadolinium is now fixed at 157.3. M. Urbain then produced *terbium* in the pure state, and its atomic weight is 159.2. He identifies it with elements sought by others, which Crookes called ionium or incognitum. All doubts upon these various points are now cleared up. Next, the metal *dysprosium* is identified with bodies mentioned by Demarcay, Crookes and others, and its atomic weight is 162.5. The most brilliant piece of work done by M. Urbain was to show that what was called ytterbium is in reality made up of three bodies which are no doubt simple elements, these new metals being *neoytterbium*, atomic weight 170; *lutecium* (174), and more recently the element *celtium*.

Safeguarding Machinery at Hawthorne

How an Electric Company Protects Its Shop Employees from Injury

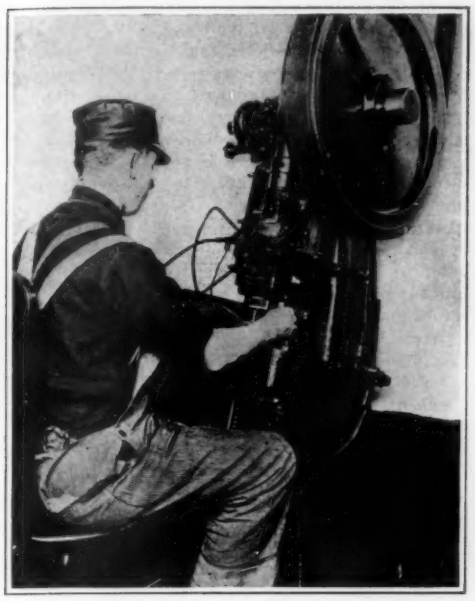


Fig. 1.—A punch press fitted with a guard which will swing down in front of the die space when clutch rod is operated by the treadle. Position of guard is shown before treadle is pressed and while work is being put in machine.

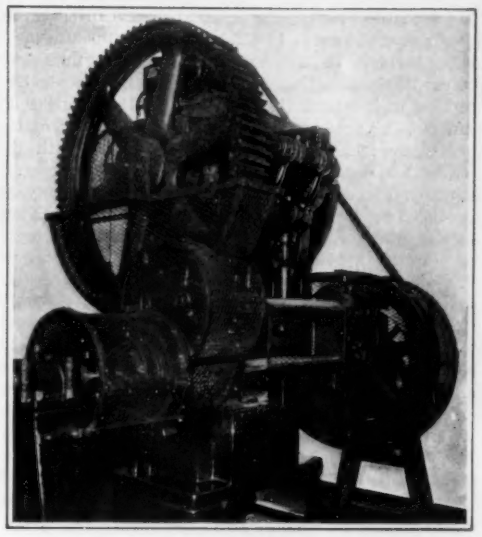


Fig. 2.—Stationary guards for protecting the complicated parts in a heavy press for forming the housings of metal subscriber sets.

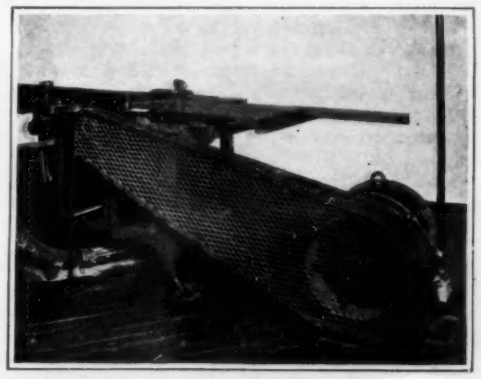


Fig. 4.—View of a method of safeguarding a woodworking machine.

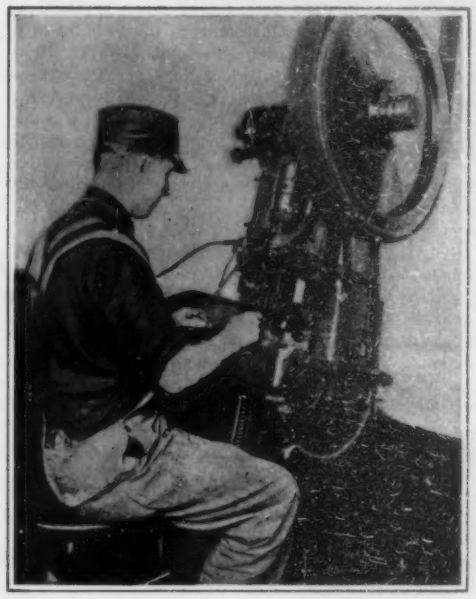


Fig. 3.—View of a punch press fitted with a guard which swings down in front of the die space when the clutch rod is operated by means of the treadle. The position of the guard is shown after the treadle has been pressed and machine operated.

THE present workers in the field of manufacturing industry are witnessing one of the most radical periods of evolution in the history of mechanical appliances.

Occasioned, no doubt, by present-day competition and by the constant demand for cost reductions, engineering skill is now being concentrated upon the production of highly efficient equipment, tools specialized to particular classes of work, and devices of many kinds designed to perform work which is difficult of execution by an operator.

One of the most important results of this general change through which the art of manufacture is passing, is the occupational adjustment demanded of the workmen. Manual operations, which have become familiar often by years of execution, are changed to the supervision and working of machines adapted to perform these operations more quickly and accurately. These manual operations were not without their associated dangers, but the dangers were thoroughly recognized, and the experience of the workmen provided the safeguards. Machinery, however, introduced new hazards for which experience had no safeguard.

Unfortunately, the evolution from manual to mechanical operations has been so rapid that the designers and manufacturers of modern machines, tools, and appliances have been forced to devote too much attention to the demand for higher speeds, greater power, and lower cost, and until recently have given too little attention to the safety of the machine operators, to whom each increase in speed or power, or each addition of new mechanism, introduces new and unfamiliar risks to be guarded against. The manufacturer of machine tools to-day is giving this feature due consideration in the design of his product, and in most cases moving parts of machine tools, such as gears, flywheels, and pulleys, are adequately protected from accidental contact.

The machines in the manufacturing department of this electric company in Hawthorne, Ill., have always been given careful consideration, so that they might be equipped with the necessary devices to protect those who come in contact with them. In addition to the general precautions which have been observed, a systematic campaign has been carried on during the past two years to reduce to a minimum the risk of injury in operating the machinery. During this period a group of from six to twelve men have devoted their entire time to fitting up machines with special safeguards. This work includes not only the covering of dangerous moving parts with guards, but also designing the associated tools so as to prevent accidents.

To offset the conditions which introduce hazards, careful analyses have been made of all situations which might be the cause of accidents, and wherever possible these conditions have been counteracted. The following are some of the more important: All belt shifters, switches or other devices controlling the operation of



Fig. 5.—A circular saw woodworking machine with guard over belt to keep the latter clear and a guard over the saw. The second guard prevents injury to the hands and the wood from coming together at the rear, jamming up and ramming the operator.



Fig. 6 shows a vertical spindle molder or "slicker" for woodworking with guard over cutter to prevent injury to hands. The machine grooves wood and all saw-dust is removed by means of an exhaust system to which a hood is connected.

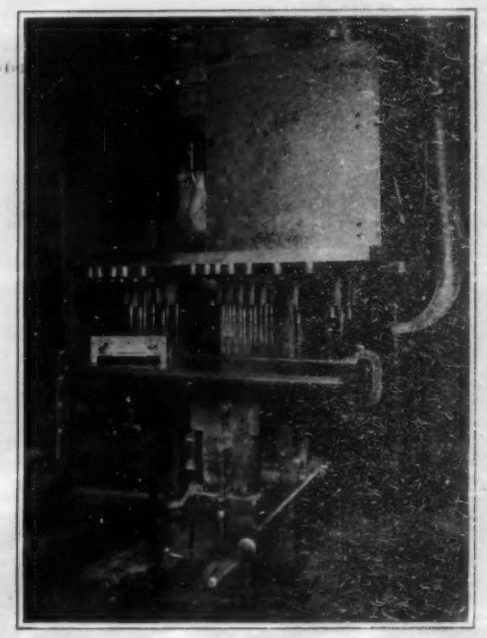


Fig. 7.—In this view the picture shows a multiple spindle drill press provided with sheet metal doors (A) in front of spindle driving shafts (B) to prevent them from flying out in case they become disconnected at the universal joints (C).

machines are located within easy reach of the operator, so that he may start or stop the machine without moving from his position while at work. In all operations which are injurious to the eyes, such as the dressing of emery wheels, goggles are furnished, to be worn while the work is being done. It is an established fact that lighting conditions are responsible for a large number of accidents, and very careful consideration has, therefore, been given to the proper illumination both of the departments and of the individual machines.

Guards are provided to protect moving parts of machines which project in such a way as to be a source of danger; to protect belts or chains driving machines from motors on the machines or on the floors, and also belts driving machines from countershafts to pulleys located on aisles; to protect all gears; to protect cutters in metal-working or wood-working machines, such as milling cutters, circular, band, and jig saws, and wood shaper cutters, and to protect emery and polishing wheels.

Some idea of the extent to which this work has progressed is obtained from the report of the Telephone Apparatus Shops at Hawthorne for the past year. A total of 1,107 guards of all types was installed, comprising 203 guards for covering gears, 200 for covering belts, 168 for protecting milling machine cutters, 105 celluloid shield guards on automatic spool winding machines, and 431 appliances of a miscellaneous nature. The guards are generally of three kinds: stationary guards for belts, gears, and other exposed moving parts; adjustable guards for saws and cutters of various types; and mechanically operated guards for use on punch presses. Aside from these are the various tools and feeding devices designed for the protection of the workman's hands while operating the different machines.

A better idea of the diversity of the hazards introduced by modern machinery, as well as the extent to which this humanitarian electric company has attempted to remove all dangerous elements, may be had by studying the illustrations shown of these types of guards. Fig. 2, which shows a stationary guard, has been selected to illustrate the complicated design of moving parts in one of the heavy presses for forming the housings of metal subscriber sets. In this case all moving parts into which the operator might slip, or be drawn by his clothing, are well protected. The guards, moreover, are so designed and located that they will in no way interfere with the operation of the machine at its highest efficiency.

Fig. 5 illustrates a typical adjustable guard, applied to a circular saw. This is, perhaps, one of the most difficult problems encountered, inasmuch as it depends for its success upon the co-operation of the workmen. Guards of this type must be adjusted to suit the work being done.

A good example of a mechanically operated guard is shown in Fig. 1, which represents a gate applied to a punch press, which is closed before the downward stroke of the ram, rendering it impossible for the operator's hands to remain beneath the punch, the guard being in position before the treadle is pressed. In other cases, where the nature of the work is such that a guard of this description cannot be used, presses have been equipped with tools through which the stock is fed, without making it necessary for the hands to be placed under the punch. In other cases dial feeds are employed, putting the work in proper position and swinging it under the operating part of the machine. The same results are obtained by sliding dies, and by chutes through which the parts are pushed to their proper location. In Fig. 3 the guard is in position after the treadle has been pressed and the machine operated. Fig. 6 represents a spindle molder or slicker; Fig. 7 a multiple spindle drill press; and Fig. 4 a method of safeguarding a woodworking machine.

During the past year the company has spent about $25,000 in designing and installing these protective devices. That the work has been done efficiently is proved by the fact that the Department of Factory Inspection of the State of Illinois has requested that we demonstrate our methods to other manufacturers, as a guide in similar work. The Industrial Commission of the State of Wisconsin has also solicited information regarding the safety devices in use at Hawthorne, to employ in its campaign to provide for the safety of employees in manufacturing plants in that State.

A Scientific Investigation of Pianoforte Touch

At a recent meeting of the Physical Society Prof. G. H. Bryan read a paper on "The Dynamics of Pianoforte Touch," which should prove of much interest to at least three classes of people. The subject has in the first place a purely scientific interest; secondly, the makers of mechanical piano players should find in the researches carried out by Prof. Bryan most valuable indications of the direction in which they must move to improve the mechanism, however perfect it is even at the present day, of the mechanical piano player, and thirdly, the subject is one which appeals to every pianist.

There is a common impression that it is hopeless ever to expect the piano player to fully reproduce the touch of the virtuoso. While Prof. Bryan does not go so far as to positively assert that this impression is erroneous, he does insist that it should not be accepted without proof or test, and he has proceeded to carry out experiments to investigate just what is meant by "touch" and whether it is capable of being reproduced to a greater extent than hitherto upon pneumatically controlled pianos.

The question turns very largely on the extent, if any, to which the *quality* of individual notes can be varied by striking the notes in different ways. Such a possibility involves the inferences that (*a*) the intensities of the fundamental tone and its several harmonics are capable of independent variation; (*b*) these variations can only be produced by varying the behavior of the pianoforte hammer while it is in contact with the string, for example, by lengthening or shortening the duration of contact; (*c*) such an effect can only be produced by rapid time variations of the pressure applied to the keys while they are being depressed, e. g., by a fairly rapid decrease or increase of pressure produced by smartly striking or heavily pressing on the key.

The author describes experiments which appear to indicate beyond all reasonable doubt the existence of such effects of "touch," and which certainly demonstrate the possibility of reproducing them by means of the modern "pneumatic" instrument. For this purpose the author's piano-player, which is a first-class instrument of standard type, but *with the whole keyboard under one common control*, was fitted with an "auxiliary lever" for which a patent application has been filed. This lever operates directly on the face of the auxiliary regulating bellows, and the air-tension in the bellows can be regulated by means of a sliding weight placed on the lever, or by applying hand pressure to the lever itself. In this way *the touch of the human hand can be transmitted directly to the keys of the piano.* So far as the experiments go, they indicate that even if the lever is worked in conjunction with suitable expression marks, as could be done by a person of moderate experience, increased breadth of contrast is obtained, while by varying the position of the lever independently of the pedaling, a variety of dynamical effects can be produced, which can further be increased by hand control.

A short sharp pressure produces a bright ringing treble with a light bass, a sustained pressure produces a rich bass with a soft treble; the general character of the tone being suitably described as "metallic" in the first case and "woody" in the second. A very conspicuous feature of these experiments is the marked differentiation which they show between notes in different parts of the scale, especially in chords, the notes of which are accurately ranged (as is unfortunately often not the case in music rolls). The duration of the pressure required to produce the maximum effect on a particular note of the piano varies continuously from the treble to the bass end, being least in the treble and greatest in the bass, and by means of this natural or dynamical differentiation notes in a particular part of a chord at any part of the scale can be accented independently of the rest.

Whether it is possible to vary the quality of individual notes is a point that can only be tested by playing single notes as opposed to chords. The differences that can be effected can only be noticed by a trained ear; in the author's experiments it has been found that some persons notice *very marked* differences, others notice very slight differences, others no differences at all. The differences are probably as conspicuous as those between a stopped string and a harmonic on the violin. It is not always easy to produce these differences for purposes of demonstration, though it is often easier to do so in the course of playing through a suitable composition. In any case the author finds that the effects can be obtained more easily with a pneumatic player fitted with an auxiliary lever than in striking the keys with fingers. When the lever is disconnected the change observed affords some indication of the origin of the popular belief in the limitations of the pneumatically played piano.

"Sitting Dharna" and Hunger Strikes

As has been pointed out by a correspondent of the London *Times*, the hunger strikes of the English suffragists represent the revival of a very old and once widespread custom, known in the East as *dharna* (or *dhurna*) *baithna*, or "sitting dharna."

This custom was once very common in India, but is now almost obsolete. It was chiefly resorted to in order to force payment of a debt. The debtor would sit at the creditor's door and taste no food until his claims were satisfied. If the debtor allowed the creditor to starve it was believed that he laid himself liable to supernatural punishment, especially if the starver happened to be a Brahmin; accordingly, Hindus of lower caste would sometimes engage a Brahmin to starve for them. The custom was much abused, being used to levy blackmail upon persons who were not debtors at all. It also gave rise to various analogous practices, e. g., that of certain beggars in the Punjab, known as "strap-riggers," who twist a leather strap around the neck and throw themselves on the ground before a shop until alms are given them. Again, in order to obtain compliance with some demand a person would threaten to commit suicide or to kill one of his own children unless his wish was granted. All such practices are forbidden by the Indian Penal Code.

An identical custom once prevailed in Ireland, and is frequently mentioned in the Brehon laws. It is recorded that St. Patrick "fasted upon" Loegaire, the heathen over-king of Ireland, until the latter embraced Christianity, and in accordance with the superstitions of the times the king and his family felt it incumbent upon them to fast at the same time until this test of endurance was won by the saint.

Vegetable Hair Industry of the South

Vegetable hair or so called Spanish, long or black moss is an epiphytic plant growing on a good many different kinds of trees in the southeastern United States, West Indies and South America. The largest and most tenacious kind grows on the bald cypress in the South Atlantic and Gulf States. It is known botanically as *Tillandsia usneoides*. The specific name *usneoides* means "like *Usnea*," a generic name of a gray lichen or so called "moss," which is common along the coast as far north as New Jersey, and which it resembles, but to which it is in no way related. The common name "moss" is a misnomer for the plant, because it is not a moss at all, but belongs to the pineapple family of plants (*Bromeliaceae*). While this plant grows upon another, it does so without deriving any nourishment from its host as does a parasite. It is more of the nature of an air plant, and hangs in long festoons from the branches of the trees throughout the moist regions of the South. It is generally considered that it does not interfere with the growth of the trees upon which it grows, except in cases where it is very abundant.

The collection of this plant is a growing industry in the South, and constitutes one of the important minor forest products, which is usually overlooked. It hangs from the branches of the trees often within easy reach, and is gathered in the time of the high floods when the swamps are easily accessible by small boats. The gathering is done by negroes at intervals of seven years on the same trees. After it is collected it is placed in large piles on the borders of the swamp, packed closely, and left to decay for about a month. During this time the linear-awl-shaped leaves and the grayish, scurfy, cellular tissue surrounding the firm, hair-like elastic fiber partly rot away. It is then dried thoroughly in the open air when it loses about 90 per cent of its weight. In this state the material is shipped to small gins located in various parts along the Gulf Coast, where it is further dried, perfectly cleaned by machinery, and baled for the market. During the process of cleaning the material is washed in boiling water and soap. It is then hung out on racks to dry and finally dusted in a fan-mill. In the operations of ginning and cleaning it loses about 35 per cent in weight. When the moss has passed through these processes a dark, coarse, tough fiber is left, which resembles horse hair. To impart a uniform color to the article it is sometimes dyed jet black, and the best qualities can hardly be distinguished from horse hair. It is used extensively for stuffing mattresses, cushions, and the like. It is usually mixed with horse-hair.

There are no data at hand to show the present annual production and consumption, but the value of the prepared vegetable hair in the South may safely be estimated at about $600,000.

The Current Supplement

In the current issue of our Supplement C. F. Fraasa gives full directions for constructing a single phase induction motor.—Our readers interested in ethnology will find in this issue an article on Siberian medicine men.—R. D. O. Johnson tells us of a fish that prefers climbing to swimming.—C. R. Darling describes experiments with liquid drops of over two inches diameter, which can be repeated by any reasonably dexterous person.—Truman G. Palmer contributes a most important article on the highly beneficial effect produced on the soil by raising sugar beets in rotation with other crops.—The new giant steamer "Vaterland," which measures 950 feet in length and 100 feet in beam, is illustrated and described.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Crews of American Ships

To the Editor of the SCIENTIFIC AMERICAN:

In the SCIENTIFIC AMERICAN of March 8th, 1913, page 223, I note an article entitled "To Upbuild the Merchant Marine," by Charles Depesee. I read the article with interest, and it contains many valuable suggestions relating to our merchant marine in the deep-sea or foreign trade. I note, however, the following:

"Why the management of an American steamer is compelled by law to employ only Americans, while the men that may be employed to build American steamers may be of any and every nationality, is one of those things past finding out. Whatever the reason is, the facts are there; and they add to the handicap that the American merchant marine suffers from."

I have noticed this statement at different times in articles written by different persons relating to our American merchant marine. It is true that the licensed officers of vessels of American registry are required by law to be American citizens, but this is not true of the crew, and those writing about our American merchant marine should understand this. J. W. ALEXANDER.

Washington, D. C.

"The Fallacy of the Spring Wheel"

To the Editor of the SCIENTIFIC AMERICAN:

The above entitled article by G. F. Fisher appeared in your valuable paper February 1st, 1913. It would appear that the article might in some cases discourage attempts to find a substitute in the spring wheel for the pneumatic tire, and in the writer's opinion it is too early in the stage of development as yet to curb any such attempts.

The greatest drawback of the spring wheel is not so much the work required of the springs as the objectionable effect of inertia of the rim weight and other parts of the wheel before the spring action is reached. In the pneumatic tire we have the almost ideal condition in the practical absence of inertia effect because of the comparatively small mass of tire affected at any moment of the wheel turn, in other words, there is practically no weight in motion differing from the radical constant of the periphery of the tire, which results in the car weight being practically floating on an air cushion.

How different are the conditions with the spring wheel! Here we have a rim and tire weight as well as a portion of the spring mechanism of possibly fifty pounds at least, which weight is wholly to be considered as outside the wheel rim so that at any fair speed the inertia of the mass and weight is a considerable quantity to raise and fall bodily over the road obstacles at a rapid velocity, in fact it is sufficient to rack a wheel to pieces.

To solve the spring-wheel problem attention should be directed toward placing all of the wheel weight possible inside of the springs and away from the rim or tire, which means that the springs must do their work as near the tread as possible, and if they are capable of acting in one segment of the rim without affecting the balance of the rim or tire the effect will be so much nearer the ideal.

The writer believes a spring wheel will yet be produced that will compete favorably with the pneumatic tire, but working with hub springs and heavy rims must give way to development of peripheral springs disposing the least possible mass of the wheel rim to action.

Along these lines there is hope.

Oshkosh, Wis. L. J. MONAHAN.

The Mississippi Problem

To the Editor of the SCIENTIFIC AMERICAN:

I wish to congratulate you on having brought out so many ideas on the problem of the Mississippi, and more particularly to thank you for correcting me in the matter of the bed of the stream. Theory alone will make it clear to anyone that so long as the Gulf of Mexico remains open, no raising of the bed of the Mississippi can possibly occur, levees or no levees. It is a real comfort to know that the lower Mississippi can really be controlled by the levees, and I am sure that many of your readers like myself feel that they owe you a debt of gratitude for having cleared their minds on this point.

However, I cannot but feel that your attitude on the problem as a whole is far from the correct one. It seems to me that you have confounded the real problem of the Mississippi with the problem of merely controlling its lower portion. For in your editorial you seem to have all but disregarded everything and everybody west of St. Louis. I submit that the real problem is not one of how to put mud and water into the Gulf of Mexico, but rather of how to put bread and butter into the stomachs of men; and the question is not, Can the flood waters be confined between levees? but instead, Can they or any portion of them be put to better use elsewhere?

You say that the trouble with the reservoir plan is the magnitude of the problem. But there remains a lurking feeling that if the floods were ever so much less in volume, you would still favor the levee system as being sufficient; and it is certain that in case the floods were many times greater, your line of reasoning would force you to declare that much more emphatically against the reservoirs. At any rate, this does not look like a question of magnitudes alone, but of principles as well. No one, I hope, favors the removal of the levees; but there is certainly much that can be said in favor of assisting them with the reservoirs.

First, common sense teaches that it is cheaper to build one dam across a river than to heighten two levees alongside of it, and also that a flood saved at the source of a river is a flood saved throughout its entire course.

Second, theory says that inasmuch as the cost of both levees and dams is roughly proportional to the square of their height, and the benefit in the case of the levees not in a greater proportion, while in the case of the dams they may by wise selection be made out of all proportion to the cost of the dam, it would be wise to at least give the dams a fair trial.

Third, the Almighty has pronounced in favor of the reservoir, as is so plainly evident in the case of the St. Lawrence, whose basin covers an area forty per cent that of the Mississippi and yet whose steady outflow is less than nine per cent of the flood record of the Mississippi, a ratio of nearly five to one in favor of the reservoir plan.

Finally, the SCIENTIFIC AMERICAN itself admits that a reduction of three or four feet in the height of the floods could be secured by converting the St. Francis basin into a reservoir, and objects to the idea only because a good-sized State would be flooded, an objection well founded so far as the St. Francis basin is concerned, but an objection that would become a mighty blessing almost anywhere west of Omaha.

And against all this you set up what authority? Col. Townsend. Under such awe-inspiring circumstances, one would feel impelled to ask with bated breath, "Who is this man Townsend?" were it not for the fact that his testimony seems to prove chiefly that he doesn't know where the water comes from!

Your attitude, then, Mr. Editor, seems to amount to this: The western man says, "Give us the reservoirs. They will be a great blessing to us and a material help to the Southern planter and to river navigation." You reply, "Yes, they would help the lower Mississippi *some*, but the trouble is that they would help you *too much* and give you just what you want, namely, water area instead of parched land. Therefore, we cannot think of such a thing!" N. J. NOBLE.

Noble, Alta, Canada.

Criticism of the Gear Engine

To the Editor of the SCIENTIFIC AMERICAN:

I have been greatly benefited by reading your excellent journal for the greater part of my life. But I am surprised beyond adequate expression at the article "A New Gear Engine," on page 249 of the issue of March 15th. If I correctly understand the proposition, and I believe I do, Fig. 1 is a very old plan, in fact it is what started me on the turbine. Steam will cut that device and render it useless in a very short time even if made of the best steam metal. But that is not the point I take exception to. It is the statement regarding the expansion, "the continuous flow against a series of pistons," cogs in plain words, aptly designated "infinite receiver." Now, if any one can find an expansive element in the continuous flow of steam into an infinite receiver I am badly off my base, but I am more than willing to learn. Then, on page 258 the continued article states, "as it uses the pressure energy of the steam instead of the kinetic energy." There is certainly no expansion possible in pressure energy, but under favorable mechanical conditions, "kinetic energy" can exert the limit of possible expansion. I only know of two kinds of practical confined steam expansion, viz., that beginning at the point of the cut-off in a reciprocating engine, and that secured by providing an increased diameter, or enlarged channels, as in a steam turbine. Of course, an unconfined expansion would be the "infinite receiver," or more properly the exhaust. This is one of the very interesting problems that have appeared from time to time and I hope you will consider it worthy of space for discussion. GEORGE J. FERGUSON.

St. Louis, Mo.

New Cycle of the Gear Engine

To the Editor of the SCIENTIFIC AMERICAN:

I would like the privilege of replying through your columns to the objections which Mr. Ferguson, in his letter which you kindly inclosed to me, raises against your article on my gear engine. It will elucidate the subject for the general reader if his letter is published together with this reply.

His misconception of the working of the engine may be due, it is possible, to the very cursory explanation of the invention which a limited space made necessary. On the other hand, his assumption that there can be but two practical ways of using steam because he "knows" of no other is naïve, to say the least. My cycle, I am eager to admit, does not appear in any book on thermodynamics. But for what purpose do inventions exist if not to prove new theories and advance new methods?

His objections, in brief, are these: First, the device is a "very old plan;" second, the steam will cut the metal; third, the pressure energy cannot be obtained from steam at a continuous flow.

In reply to the first, I must say that the United States Patent Office differs radically in opinion with Mr. Ferguson upon the novelty of the invention, and has granted very broad claims on the very uniqueness of its construction and art. There are several drawings of gear engines in the Patent Office which look like this device, but in fact are very different.

My answer to his second contention is that thorough tests in actual service of my gear engine since 1907 have conclusively refuted any theory that the steam might cut the metal. The reason for this is a mechanically simple one; the surface of the gear travels through the center piece at a high rate of speed, and the steam has absolutely no chance to flow steadily through any small clearance between the gears and center-piece wall; while in the case of a slide valve, the steam will cut the metal because there is so little motion in the parts. It must be remembered that the surface of any high-speed rotor does not remain at a fixed distance from any closely adjacent surface, and the rapid alteration of this clearance assists in churning up the leakage steam and prevents cutting.

Thirdly, my critic has patently not understood what is meant by the expansion of steam at a "continuous flow against a series of pistons having what is termed an infinite receiver between them." The term "infinite receiver" does not refer by any means to the series of spaces between cogs in a single-stage engine, but to the chambers which inclose respectively the successive pairs of gears in the multistage unit. An infinite receiver is commonly accepted to mean a receptacle of any size wherein the temperature and pressure of steam is constant. Therefore the several stages of a multistage gear engine or multistage turbine are properly designated "infinite receivers," inasmuch as the continuous flow of steam within each stage renders any change of temperature or pressure inappreciable.

I doubt if Mr. Ferguson has grasped the principle, moreover, upon which the steam acts in this engine. The steam is admitted above or below the intermeshing point of the gears according to the direction in which they are meant to be propelled, and being confined by the center piece, forces the teeth away from the intermeshing point by pressure energy, precisely as against a piston. It does not act with an impact, such as with turbine blades. The work done by this first pair of gears corresponds to the work done in a cylinder engine up to the point of cut-off, and it is by combining with one or more additional sets of gears, having teeth of increasing area, that the expansive power is obtained. In a piston engine the internal energy of steam is utilized expansively as *pressure* against the piston after the point of cut-off; in a turbine, in the form of kinetic energy while the steam is working in a *continuous flow*. My multistage gear engine utilizes the *pressure* energy of steam while expanding it at a *continuous flow*.

The best experts on thermodynamics acknowledge that the use of such a cycle is new and has many advantages over cycles now in use. My critic will please note that Prof. Parr of Columbia was quoted thus in your article: "The advantage of this cycle lies not so much in the cycle itself as in the form of the machine which the cycle permits to operate upon it." It is the very high percentage obtained (at the brake) of the theoretical work of my cycle that enables the water rate of this engine to be excellent, although the cycle itself is not claimed to be, in a limited number of stages, as ideal as the Rankine. Using dry steam from 100 pounds gage to atmosphere, the efficiency of my cycle for one stage is 49 per cent of Rankine, two-stage 69 per cent, three-stage 77.5 per cent, four-stage 81 per cent, eight-stage 91 per cent, etc. In an infinite number of stages my cycle equals the Rankine cycle, even though the steam does not at any time expand adiabatically.

But while in the single-stage my cycle is only 49 per cent of the cycle upon which all other types of engines work (the Rankine), nevertheless the tests show the water rate obtained from this single-stage engine is better than those of the average piston or multistage turbine of equal horse-power. It can be readily seen that a multistage gear engine with its tremendously increased cycle efficiency should equal, even in small units, the economy of the largest turbines now in use.

New York city. C. H. CLARK.



Launching a motor boat at Dayton, Ohio, to go to the rescue of flood victims.

The Recent Great Flood

What May be Done to Prevent Such Inundations in the Future

(Photographs by Underwood and Underwood)

DURING the latter part of March and the early part of April of this year the Ohio River system was visited by the most remarkable flood in its history. The successive phases of this occurrence were as follows:

(1) Torrential and long-continued rains over the north-central watershed of the system, dating mainly from March 23rd. At many places the rainfall was without precedent. Thus up to the morning of the 27th Bangorville, Ohio, had a total of 9.50 inches (the normal rainfall for the whole month of March at that place is 3.93 inches); Marion, Ohio, 10.60 inches (normal for the month, 3.51 inches); Bellefontaine, Ohio, 11.16 inches (monthly normal, 3.79 inches). Eye-witnesses describe the rain as coming down in solid sheets, as in a cloudburst. Previous conditions were not especially favorable for floods. River-stages were not high before the great rains began; there was no snow on the ground, to cause by its rapid melting the sudden swelling of the streams, as so often happens in spring freshets; and, lastly, the ground was not frozen—a condition that prevents the rain from soaking into the soil and thus increases the percentage of run-off. Nevertheless, the rivers of southern Ohio and Indiana experienced the worst floods on record in that section. Flood warnings were issued from Columbus by the Weather Bureau on the night of the 24th, a few hours before disastrous conditions began. No one, however, could foresee the magnitude of the visitation. While flood prediction for such rivers as the Ohio and the Mississippi is comparatively easy, with the present elaborate system of river-gages and rainfall stations, and becomes more and more accurate with increasing distance from the headwaters of these rivers, no means is known to science of giving timely and accurate warning of high stages in the smaller tributary streams. The weather



Life lines strung across a Dayton street to save persons floating down on wreckage.



Woman and child rescued from their home in the flooded district of Albany.

map is an uncertain guide; for while, on the one hand, with the prevalence of certain types of weather the forecaster can be certain that floods will *not* occur, with other more or less frequent types there is always danger of floods, but the danger is not so clearly indicated as to warrant the forecaster in alarming the community with warnings that, nine times out of ten, would not be verified.

(2) By the morning of the 26th the rainfall area had spread to the southern watershed of the Ohio, and also to the headwaters above Pittsburgh. Thus from north, south and east huge volumes of water were pouring into the main river, along which flood-stages were soon exceeded. The flood on the Ohio, although attended by stages exceeding at some points any ever before recorded (at Parkersburg the previous record was exceeded by 5 feet), entailed little if any loss of life, as its occurrence was foreseen in good season. A high-water crest normally takes a day to travel from Pittsburgh to Wheeling, another day to reach Parkersburg, three days more to reach Cincinnati, and six days more to reach Cairo. These figures are considerably modified by the compounding of wave-crests from tributaries, but they illustrate the fact that the movement of a flood along a great river is relatively slow, and if the forecaster knows in a general way the conditions over the tributaries he can predict river-stages from day to day at down-river points with considerable accuracy.

(3) On the morning of the 27th rain or snow was still falling over the whole watershed of the Ohio and throughout the northeastern States. Serious floods occurred in several sections outside of the Ohio system. The James River, at Richmond, reached 17.5 feet (7.5 feet above flood-stage) on the 30th. Floods were widespread in the State of New York. At Albany on the 28th the highest stage ever

previously recorded was exceeded by 1.2 feet; at Schenectady by 3.5 feet. On the 27th the weather cleared up all over the eastern States.

(4) At the beginning of April the center of interest shifted to the lower Ohio, where the flood proceeded normally, as there were no further rains of any consequence to complicate the situation.

From the foregoing summary it will be seen that of the four periods into which this series of floods may be divided, only the first was particularly striking and sensational. It was attended by a great loss of life, as compared with ordinary river floods in this country, although, according to present estimates, probably not more than a tenth as great as that caused by the bursting of the Johnstown dam, in 1889, or that attending the irruption of a storm-wave at Galveston in 1900, and almost insignificant compared with the loss of life in some of the river floods of China and the storm floods of India. It was, however—not to mention the colossal damage to property—great enough to arouse throughout the country poignant interest in the question: How can such occurrences be prevented?

An enormous amount of earnest thought has been devoted to the same question in connection with earlier floods. The solution of the problem is still remote, but much has, at least, been done toward correcting erroneous ideas. Thus, it was once generally believed that floods were largely the result of deforestation. Today the relations between forests and floods tend to become a merely academic question; or, at least, no competent student of the subject now looks upon the forest as a factor of prime importance. Contemporary opinion is perhaps best reflected in the recent "Final Report of the National Waterways Commission," which is based upon the views of numerous experts in and out of the Government service. The gist of this long report, so far as it concerns forests, is that while under one set of conditions they may exercise a beneficial influence on stream-flow and floods, under another their influence is probably harmful—while the fact that they have any important influence remains to be demonstrated.

The same report discusses at great length the practicability of storage reservoirs for (1) flood prevention, (2) the prevention of stages too low for navigation, and (3) the production of power. One great obstacle to the success of such reservoirs is the fact that in proportion as they serve one of these three purposes they are less well adapted to serve the other two. To quote from the above-mentioned report:

"To obtain the maximum effectiveness for flood prevention, the reservoirs should be lowered as soon as possible after a heavy rain sufficiently to afford storage capacity to catch the water from the next storm. This means less power developed and less benefit to navigation. If reservoirs are operated primarily for navigation they are filled during the rainy season, and water is held until needed during the summer months. If, after they are filled, a heavy rain should come, they would not be in a position to catch and hold any of it, and, therefore, could exercise no influence upon the flood level."

Methods of avoiding this difficulty have been suggested, but they involve reservoirs of relatively large capacity and proportionate expense. However, the whole question of using reservoirs for any of the purposes mentioned hinges upon the relation of their cost to the value of the results to be obtained, and as the country develops, this question is likely to solve itself; at least in small and densely populated river-basins. This is substantially the opinion of the National Waterways Commission, which has declared that "flood prevention is primarily a local problem, and the work of controlling floods should in the first instance be undertaken by the minor subdivisions." The coordination and consolidation of such efforts will, no doubt, rest ultimately with the Federal Government.

Removing Stains from Tea Cups

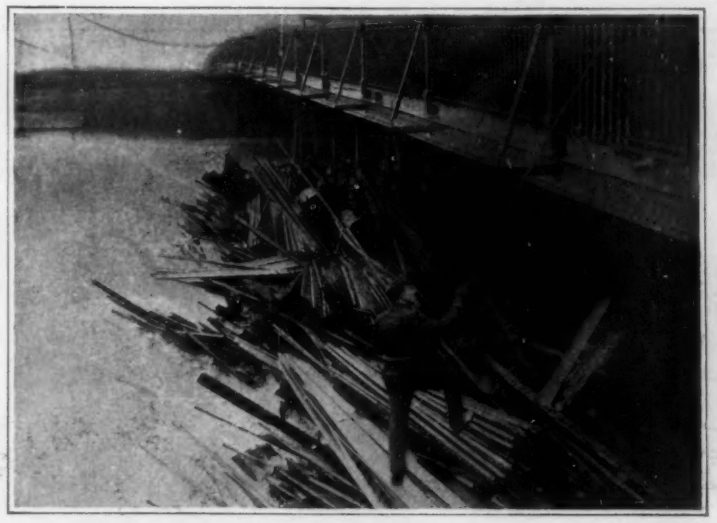
TO remove tannin stains from tea cups or any other porcelain ware a pasty mixture of salt and strong acetic acid should be used. The mixture should be applied with a cloth, and after the stain is bleached out the cups washed and dried.

Cocainomania at Montmartre

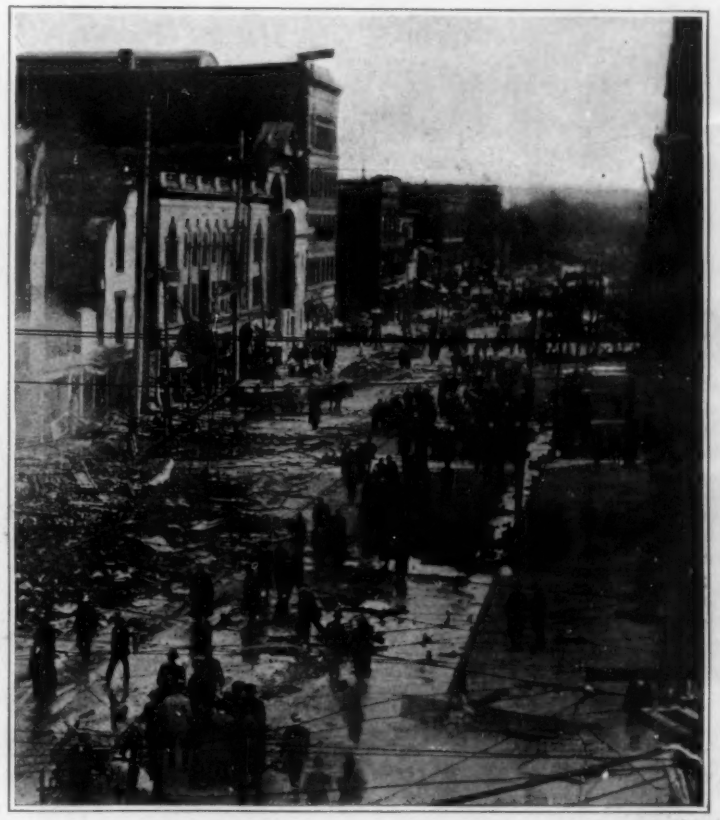
THE Société de Médecine Mentale and the Société Médico-Psychologique have recently been investigating the new epidemic of "cocainomania" which has broken out in the famous Parisian suburb of Montmartre. Dr. Marcel Briand, the alienist of the Sainte Anne Asylum, has made an especial study of the question; his intern assistant, Dr. Vinchon, who, at his request, visited Montmartre to explore, gives to *Le Temps* an interesting account of the conditions, which are substantially as follows: It is all a matter of fashion and snobbery. Fashion has a great influence in the suburban life of Montmartre: everybody there is as concerned about the doing and the behavior of everybody else as if it were a little provincial town. They even have their little gossipy papers to report the doings of the well-known local characters. These sheets inform you, for instance, that Mademoiselle Jane or Mademoiselle Irène has just been cruelly abandoned, and is consoling herself with cocaine, or, to use the shorter Montmartre term, with "coco."

Naturally, as the poison has been spreading for some years, a considerable illegal traffic in it has come into existence, in spite of the vigilance of the police, who are almost powerless to suppress it. The cocaine is procured by the employment of prescriptions, which are shown at one pharmacy after another, or else from disreputable shops which sell the poison without asking any questions. These transactions are not conducted by the consumers themselves, but by go-betweens—touts or female attendants attached to the cafés and other resorts—who put the poison into small boxes and sell it as high as four or five francs per gramme. In the music halls one often sees young women seated at tables with a glass of port and one of these easily recognized little boxes in front of them. As the supply diminishes, late at night, prices rise, and sometimes as much as forty francs is paid for a gramme of cocaine snuff—often adulterated at that. There are mysterious ways of obtaining the drug by night; for instance, you throw a pebble at a lighted window; a little basket tied to a string is let down; you put a certain sum into the basket, it is drawn up and let down again with the worth of your money—or nearly—in cocaine. At least half the women known as *femmes de Montmartre* are addicted to cocaine. One reason for the extent of the habit is the ease with which it is practised—no need of pipes, as for opium, or hypodermic syringes, as for morphine. Moreover, the desired effect is produced by the very first dose, and not after one or two experiments, as is the case with morphine.

The cocainomaniac is recognizable by several signs. The method of taking the drug induces a habit of sniffling. Eventually necrosis of the nasal cartilage sets in. The victim is subject to tremors, and reaches her hands for the little creatures which she thinks she feels buried under the skin. In a more advanced stage hallucinations come on, she thinks she hears voices insulting her, and this gives rise to quarrels which end in poison. A morbid longing for rapid movement induces the victims to take long automobile rides—with or without money to pay the fare. The end of it all is the insane asylum, reached by way of the police courts.



Preparing to dynamite a jam at one of the bridges in Youngstown, Ohio.



One of Dayton's principal streets as it appeared when the floods receded.

The Singing of Telegraph Wires

AN active discussion has been going on in the German periodical *Das Wetter* as to the cause or causes of the singing or humming of telegraph wires, and the possible relation of these sounds to the weather. There appears to be a widespread belief that the singing is a prognostic of storms and rain, or, according to another version, of cold weather. As long ago as January, 1900, the journal above mentioned reprinted from a German newspaper an article by Dr. Eydam of Brunswick in which the writer claimed that infallible weather predictions could be made from these sounds, the pitch and loudness of the sounds indicating how soon bad weather would occur.

The recent revival of this subject dates from a suggestion made a couple of years ago by Prof. Arthur Field of Ottawa (quoted in *Das Wetter* of December, 1911), that the immediate cause of the vibration in the wires was a "seismic unrest" in the ground, this, in its turn, being a harbinger of bad weather.

The obvious explanation of the singing is that it is due to the wind, as in the Æolian harp. It is claimed that the sounds occur when the air is absolutely calm, but of course there might be some movement of the air at the level of the wires when there was none at the lower level of the observer. Otto Meissner, who has been making systematic observations of the phenomenon during the past year, is unable to find any relation between the sounds and the force of the wind, but he does find that the direction of the wind relative to the direction in which the wires run is an important factor. His investigations also disclose the fact that the singing of the wires is by no means simultaneous at places only a few miles apart. This fact, as well as actual comparisons with seismographic records, appears to dispose of the hypothesis that the singing is due to microseisms. Meissner has also disproved the belief that the sounds foretoken bad weather.

Variations in the pitch of these sounds may reasonably be ascribed to changes in the tension of the wires with varying temperature.

A Terrific Hot Windstorm, which occurred in Tasmania January 13th, did incalculable damage to the fruit crop of that colony. In some districts the crop was entirely wiped out, while elsewhere the orchards lost from 40 to 50 per cent of their fruit.

A Narrow-gage Self-propelled Passenger Coach

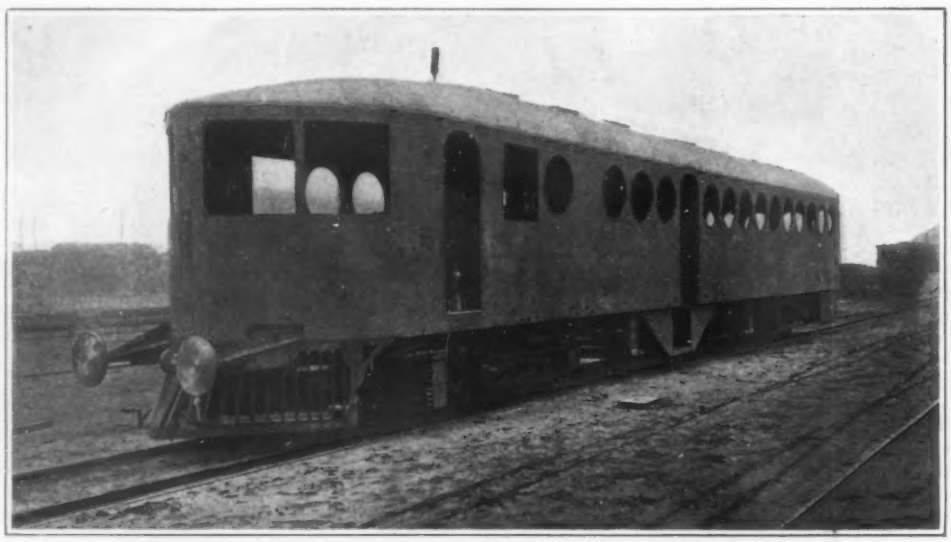
A Novel Gasoline Car with Transversely-mounted Motor

By Stanley Petman, M.E.

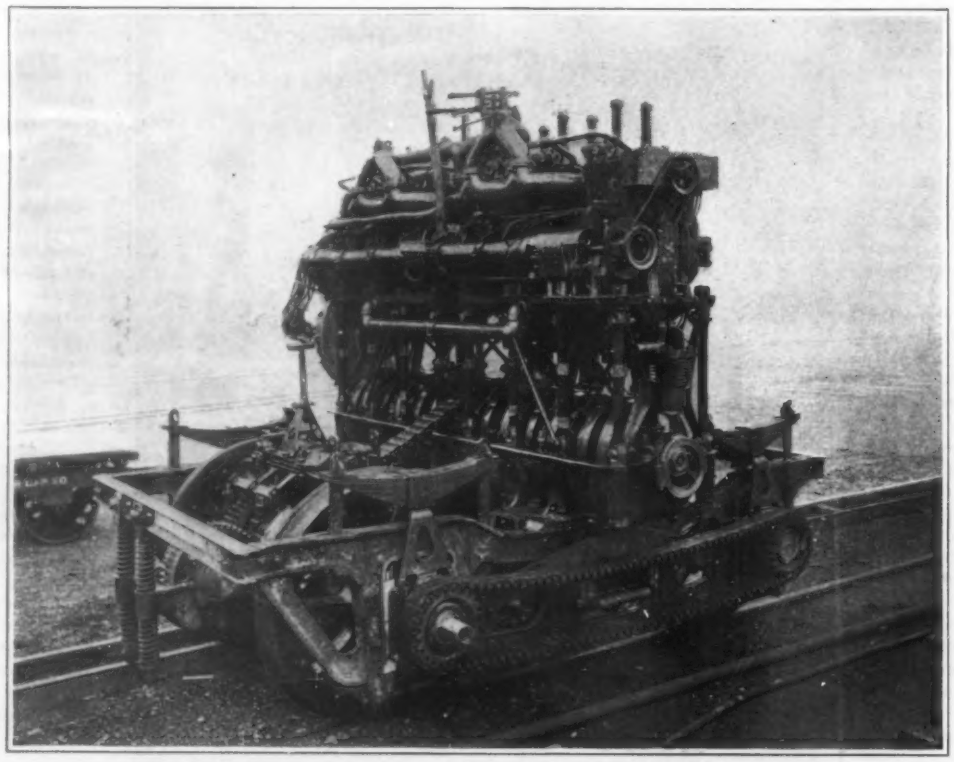
WITH the practical perfection of Dr. Rudolph Diesel's internal-combustion locomotive, which already has undergone successful tests in Germany, greater attention is bound to center on the self-propelled passenger coach utilizing comparatively cheap oil fuel, or even gasoline, for it has been demonstrated that the total operating expense of vehicles of the latter type, employing the lighter hydro-carbons, can be reduced to nearly one quarter that of a steam locomotive with one car and half that of an alternating current coach.

Although gasoline-propelled passenger coaches of standard size and gage are used to a considerable extent, additional interest attaches to the car, of which a photograph is reproduced herewith, by reason of the fact that it was constructed for special purposes which restricted the permissible gage to 3 feet 6 inches instead of the standard 4-foot 8½-inch gage. It is one of five recently shipped to Australia for service on the Queensland government railways, and though its principal point of difference from others of its kind lies in its narrow gage, its construction also incorporates a number of other interesting features.

Thus, for instance, the engine is placed transversely to the chassis instead of longitudinally as is the usual practice. It is a massive six-cylinder motor with a bore and stroke of 10 inches and 12 inches, respectively. It drives all four wheels of the forward truck through the intermediary of a multiple disk clutch and a simple two-speed gear which permits the necessary reduction for starting and slow running. The transmission of power between the two pairs of wheels, as may be seen by the accompanying photograph, is by Morse silent type chains, and it is understood that the mechanical efficiency of the arrangement is as high as 96 per cent. The engine is rated at 200 horse-power, and as it is air-starting and reversing, no provision for a reversing gear is necessary. The remainder of the power unit embraces 3-foot steel-tired, cast-steel center driving wheels carried in 6 by 10-inch journals; the wheelbase of the trucks is 6 feet and of the complete car, 40 feet.



Narrow gage gasoline motor car for the Queensland Railways, Australia.



Two hundred horse-power transversely-mounted engine of the gasoline motor car.

Another point of difference between this car and others is that the position of the operating levers has been reversed for left side control. Also, instead of the standard Master Car Builders' Association's couplers, a side type of buffing gear with draw hook and screw couplings is employed.

The total capacity of each car is 69 passengers, of which 55 are accommodated in the main compartment and the remaining 14 in the smoker, which is next to the operator's "cubby hole." To facilitate the handling of passengers at elevated as well as at road-side stations, the center entrance is depressed, the step coming very close to the ground. Artificial illumination is provided by a complete self-contained electric lighting system.

The weight of the car is 60,000 pounds and its principal dimensions are as follows: Length over end-sills, 59 feet; length over buffers, 62 feet 5¼ inches; width over sheathing, 8 feet 9 inches; length of passenger compartment, 31 feet 7⅜ inches; length of smoking compartment, 8 feet 9 inches; inside height from floor to ceiling, 7 feet 8½ inches; distance between center plates, 34 feet.

The cars were shipped to Australia completely "knocked down" and will be set up on arrival by an expert in the employ of the manufacturers.

Greenheart Timber

A CIRCULAR just issued by the United States Forest Service contains a mass of practical and very useful information on greenheart. The want of such a treatise has long been felt; indeed, there is an urgent demand for a work furnishing full information on this wood, its availability, price and properties. Such a work, appearing concurrently with the use of this wood in the lock gates at Balboa, Canal Zone, will naturally be in demand and will prove of very great value to builders, engineers, contractors of marine and naval construction, and wood users in general. This circular on greenheart is the fourth of a series of publications on the commercial woods now imported into this country. In them is condensed and arranged a large amount of useful information in a systematic and classified form. This effort of the Forest Service to diffuse information on imported woods is certainly to be commended. It is surprising how little is known generally of the various imported woods, and these publications will be read with interest by many.

The circular on greenheart is not a mere compilation of facts from unauthoritative sources, but it is a thoroughly practical work. Without professing to be a treatise on the mechanical properties of the wood, it furnishes valuable descriptive details of the gross characteristics and special information on the microscopic features, which serve in distinguishing this wood from its inferior substitutes. The various powerful tendencies of modern building and marine construction seem to point strongly toward a larger consumption of this valuable timber. It is the duty of experts to take the initiative as regards supplying a discussion dealing with the gross and minute characters of the wood, which will be of service to the wood user in determining whether the wood delivered to him as greenheart is the genuine kind. There are other closely allied trees whose woods are coming into general use, but the test of years has shown that they are far less serviceable. A most accurate knowledge of the structural characteristics of greenheart is imperatively necessary to be able to discriminate between the true and the inferior allied kinds, the timber of which, notwithstanding the close specific affinity of the trees themselves, is often found to be widely different in its adaptability to a particular work or in its resistance to the ravages of marine borers or other destructive animals. Hence descriptive details and good sharp illustrations are now offered in this publication, which will render the recognition of this leading British Guiana timber safe and altogether free from difficulty.

Fuller's Earth

FULLER'S earth derives its name from its use for the fulling of cloth; but this is now its minor function. Its principal use in the United States is in bleaching, clarifying or filtering crude oils and grease. In clarifying oil the earth is first finely ground and then packed into long cylinders through which the heavy, black, mineral oils are allowed to slowly percolate. The oil which first comes out is perfectly water-clear and thin. The succeeding oil becomes yellower and yellower as the earth becomes charged with impurities until after a maximum shade of yellow is reached, the fuller's earth itself is clarified by a steaming process, when it is ready to use over again.

In clarifying vegetable oils a different method is employed. The oil is heated to boiling in large tanks, when fuller's earth is added and vigorously stirred in. The mixture is then filtered off through bags and the coloring matter remains with the earth, the oil being a very pale straw color. Our present production of fuller's earth is from 35,000 to 40,000 tons a year.

An Improvised Drill Press

By W. D. Graves

FOR an occasional light job a large cabinet maker's clamp and a ratchet brace may be made to serve as a very efficient drill press. A short stout wood screw or flat-headed rivet, with the point filed to a smooth conical point, serves as an end bearing for the brace spindle, while the piece to be drilled is placed against the end of the clamp screw; all as shown in the accompanying photograph.



Emergency drill press for light work.

The arrangement is somewhat awkward for one to operate alone, but if he has a helper to turn the brace while he steadies and feeds the work, it is very effective indeed.

Chipping or Dissolving Scale from Cylinders

By George Rice

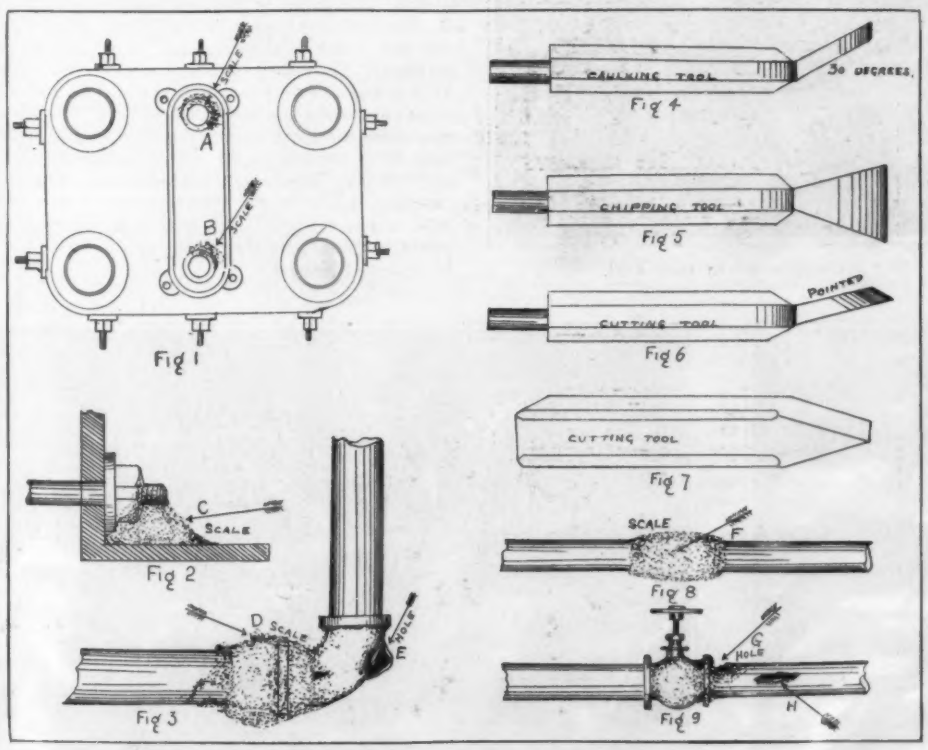
THE accompanying drawings show how scale is apt to collect in automobile cylinders and accessory parts and also the tools that may be used to remove it. While some owners and repairers of automobiles take special steps for the prevention and elimination of scaly matter from the cylinders, others are very careless concerning this bothersome problem, and as a result they are apt to have overheated cylinders due to the presence of the foreign matter. Of course, scaly accumulations are caused by the use of imperfect water. If hard water is all that is available, water softening and purifying compositions must be employed for dissolving the scale. There are patented mixtures for this purpose. Washing soda is used by some motorists with a certain degree of success.

The accumulated matter about the parts *A* and *B* in Fig. 1 was of course sufficient in bulkiness to interfere with the passages. In order to remove this foreign substance the cover was taken off and chipping tools employed for cutting off the bulk of the matter, after which soda solutions were admitted into the cylinder to eat into and soften the remaining substance. In another case one of the bolt heads inside the cylinder was choked with scale as at *C*, Fig. 2, and the bolt had to be broken out for removal, as the nut was too firmly fixed by the foreign substance to permit of turning off on the thread. In another instance the scale had gathered for a long time on the surface of a pipe joint as at *D*, Fig. 3. In one place, at *E*, a hole was created as a result of the foreign matter gradually eating into the metal shell of the elbow. Finally when the shell was extremely thin and lacked sufficient power to resist the pressure from within, the metal expanded and broke, making the fracture as shown.

In the next four illustrations are shown some patterns of calking and chipping tools of a home-made style. You can buy your chipping tools of this kind in readiness for use in any hardware store or automobile dealing establishment. But often specially forged tools are wanted. You can get the tool steel blanks and have the chisels forged as wanted and to the pattern required.

Fig. 4 is a calking tool with a 30-degree nose, and from this slant you can get any degree for the bevel as may be desired for the special service to which you intend to put the chisel. A common form of effective chipping chisel for removing scale from cylinders and pipe surfaces is shown in Fig. 5. A handy cutting tool for chipping into the scaly matter in crevices is shown in Fig. 6. The form in Fig. 7 is useful for the average cutting service on scale formations.

Fig. 8 shows a gathering of scale on a pipe and Fig. 9 an accumulation about one of the check valves. The holes *g* and *h* are the result of the foreign matter slowly but surely weakening the metal by eating into the fiber and destroying it. The thinned surfacing cracks at slight pressure and a hole results. The best way is to examine the parts of the mechanism liable to be coated with scale from the water and take steps to prevent the accumulation of the substance.

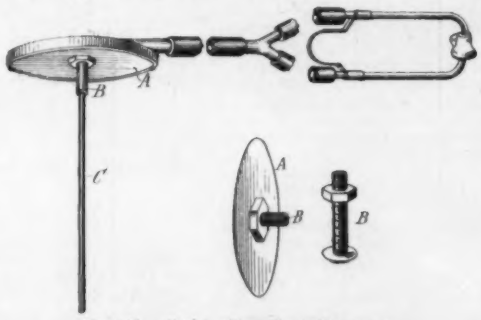


Scale accumulation and tools for removing it.

Altering a Stethoscope to Locate Motor Knocks

By William R. Ingham, M.D.

EVERY physician has a stethoscope. Nearly every physician has an automobile. The stethoscope detects an abnormal heart sound, and with a slight variation this same instrument detects an abnormal motor sound just as surely.

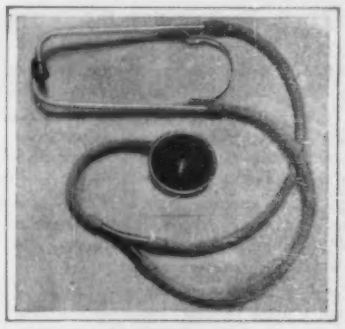


Details of the altered stethoscope.

This is how the writer did it. A new diaphragm is made from a thin piece of hard rubber (an old slide from a photographic plate holder in this case). A brass dry battery bolt cut off to about ¾-inch and with a hole drilled in the end is placed in the center of the disk and the nut is tightened up.

In the accompanying drawing *A* is the diaphragm, *B* the battery bolt and *C* a heavy wire threaded or otherwise fitted into the hole drilled in the bolt *B*. A jointed brass cleaning rod for a 0.22 rifle is just the thing.

The device is now ready for use. Place the tubes in the ears and tap the rod lightly with the finger nail; if a spring brass wire is used, it will sound like the ringing of church bells. The ticking of a watch placed on the floor is plainly heard through the wire. A very slight knock in the motor, scarcely heard with the unaided ear, sounds like a heavy hammer blow, through



Stethoscope altered to locate motor knocks.

this instrument. A valve gear knock is easily traced to its source by trying one valve after the other. Simply place the end of the wire against the valve lifter housing.

Sitting in the moving car with a long wire in the stethoscope projecting through a crack or hole in the floor, and resting on the differential housing, or transmission, universal joint housing, or wherever suspicions indicate, a knock, squeak or grating is easily traced.

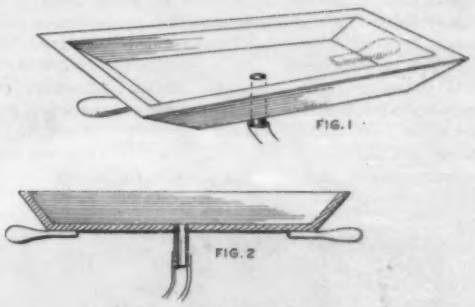
Convenient Wood Steaming

By O. Ruehmer

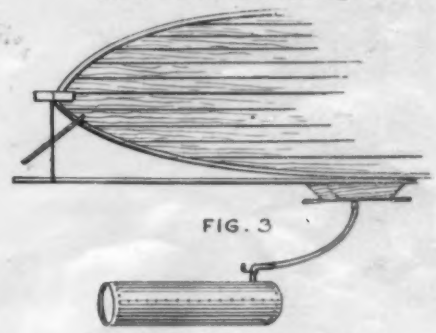
THE following device for steaming planking on the hulls of small boats will be found very efficient.

A box is constructed of light wood or metal of the shape shown in Fig. 1. The open end should be about 12 inches long and of a breadth not greater than the narrowest part of the plank to be bent. The depth is about 4 inches and at the center of the bottom a short piece of iron pipe is secured, to one end of which a hose is attached. A pair of handles can be placed on each side of the pipe to facilitate handling. The edges of the open end should be covered with cloth loosely nailed, or if preferred, weather strips can be nailed on the sides so as to form a tight joint when the whole is pressed up against the board. The board to be bent being in place as shown in Fig. 3, a sling is placed over the end and a stick inserted in the sling to form a tourniquet with which the end of the board may be pulled. Now by applying the steaming box as shown and attaching it by means of a hose to a boiler or kettle the plank is easily bent and the tourniquet tightened.

There should be no hurry in moving the box as every part of the plank should be steamed in order to obtain a true curve. A pulley fixed on a firm support can be used instead of the sling. As the planking on the sides of a boat tapers from the center to each end, the box, as stated, should not be wider than the narrowest end. In order, therefore, to get good results when working on the wider part it will be necessary to keep moving the steaming box up and down.



Steam box for boat building.



Method of using the steam box.

Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

Power Truck Emancipates the Baggage Man

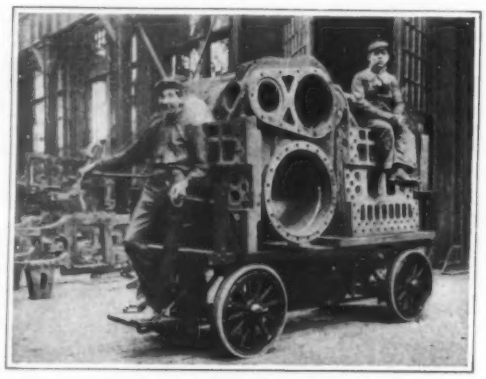
By Joseph B. Baker

AT railroad stations and shipping wharfs, the terminals of powerful steam transportation, the handling of freight and baggage by hand labor presents a remarkable inconsistency. The mountain of baggage from an arriving passenger train, for example, has hitherto been trundled a few pieces at a time on an ordinary hand "baggage truck." At the steamship dock the cargo is slowly and laboriously loaded and unloaded by a swarm of human workers each transporting a load of scarcely his own weight.

The need of some more efficient means of handling freight on platforms and docks and in the shipping departments and shops of industrial works as well, is met in the electric platform truck, replacing the laborious hand-operated truck. This sturdy, powerful little storage battery vehicle is emancipating the baggage man, stevedore and factory laborer. Instead of pushing like a pack animal a few trunks or packages of freight, the operator of the power truck stands or sits at the steering wheel guiding many times the former load to its destination with no dependence on human muscle and with great saving of time.

The several different types of electric platform truck now coming into use include three-wheel and four-wheel vehicles with rubber-tire wheels driven through sprocket wheel and chain or through gears. The compact storage battery constituting the motive power is slung beneath the platform of the truck, leaving the platform clear for its load and entirely flush except for the steering post at the front or rear end. One three-wheel truck with steering wheel in front, used on a new New York freight pier, weighs 2,650 pounds empty and occupies a platform space of 4 by 10 feet. It can run eighteen miles on one charge of the battery at a speed of 4½ miles an hour, carrying a load of 2 tons. A type of four-wheel truck, somewhat larger and heavier, is a double-ender, built like joining two of the three-wheel trucks back to back; that is, with the four wheels arranged at the corners of a diamond figure. The truck is built in two halves, connected by a hinge joint in the frame over the driving axle, a construction which allows either of the driving wheels to drop into a rut or ride over an obstruction without straining the vehicle when loaded. The steering gear operates both the front and rear wheels, enabling the truck to turn sharp curves. The low-platform baggage truck shown herewith is one of a considerable "fleet" now in use at the Pennsylvania Railroad Station, New York, effecting a saving of about 60 per cent as compared with hand hauling.

The usefulness of these platform trucks depends largely on their ability to maneuver in a small space, as in threading their way in and out of freight cars and the aisles of a machine shop. The ordinary four-wheel truck, steered by turning the two front wheels, has a radius of action equal to twice the wheel base. If the truck is built to steer with both sets of wheels the radius of action is reduced to about equal the wheel base. An especially powerful truck drives and steers all four wheels; and another type, designed for working in very close quarters, drives all four wheels and steers all four with the further refinement of turning each wheel so as to be truly tangent to its track on curves and reducing the radius of action to about one half the wheel base. An advantage of this arrangement is graphically shown in the annexed diagrams showing the radii of action of the three different constructions. The arrangement shown in Fig. 2 gives remarkable mobility, enabling the truck to be turned completely around in about its own length and to approach a loading platform sideways. Narrow spaces can be entered, and it is easily possible to go into a box car, proceed to either end and back out.



Power truck carrying castings in a railway repair shop.



Fig. 1.

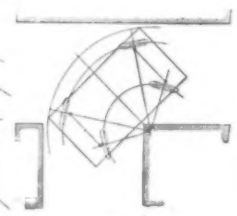


Fig. 2.

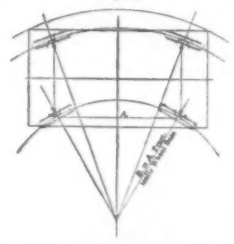


Fig. 3.

Fig. 1.—Two-wheel drive and steer; radius of action twice the wheel base. Fig. 2.—Four-wheel drive and four-wheel steer; radius of action about half the wheel base. Fig. 3.—Two-wheel drive and four-wheel steer; radius of action about equal to the wheel base.

Diagrams showing maneuvering ability of platform trucks with different steering and driving arrangements.



Gasoline-driven rock drill.

Gasoline Rock Drill

ILLUSTRATED herewith is a rock drill consisting of a two-cycle gasoline engine whose piston constitutes the hammer of the drill. The hammer is acted on directly by the 300-pound explosive pressure, and when it strikes a blow on the shank of the drill steel it is absolutely free from all connected parts of the machine. In fact, it strikes the same blow as an air drill which has no crank-shaft. The piston is returned by energy stored in a flywheel, and is picked up for the return stroke on a cushion of air. At the same time the drill steels are automatically rotated by chain and sprocket connection with the crank-shaft operating through a worm to reduce the speed of rotation. The drill steels may be either hollow to admit water and some of the explosive pressure for the purpose of removing rock cuttings from the hole, or they may be solid, in which case they are formed with a spiral conveyor that works the cuttings out of the hole after the manner of a wooden auger. The engine is of the two-cycle single acting type, free from cams, gears, push rods, etc., and may be run at a speed of 3,000 revolutions per minute. There is no deflecting plate on the piston and the inlet and exhaust ports are not oppositely disposed, so that there are no leaks between the ports as in the ordinary construction.

Automatically Operated Railway Switch

WHEN a freight train or a passenger local has to take a siding to permit through trains to go by, unless there is a tower man to operate the switch, it is necessary for a brakeman to go ahead and open the switch, wait until the train takes the siding, then turn the switch so that the main track will be clear; then after the express is by, he must go to the other end of the siding, open the switch by hand, wait until the train pulls out on the main track, close the switch behind it, and keep the train waiting until he has time to walk up to it, and mount the last car. This calls for three stops of the train. To overcome this tedious process, many suggestions have been offered. Not long ago, the automatic switch shown in the accompanying engraving was installed on a siding of the Chicago and Northwestern Railway. Normally, the switch is closed unless operated by the hand lever. At a short distance from the switch, there is a trip which may be operated by a roller on the locomotive to open the switch. The switch is then held open by the wheels of the locomotive and the following train. After the last car has taken the siding, the switch closes automatically. The roller which operates the trip is shown at *A* in our illustrations. It is mounted on the end of a plunger, which fits into a cylinder *B*. The engineer may force the plunger out to operative position or retract it by turning an air valve, communicating with the cylinder. The roller in passing over the trip *C* depresses it, throwing the switch. The switch is then held open by a guard *D* that runs along the track. This guard is engaged by the wheels of the train, and set in depressed position.

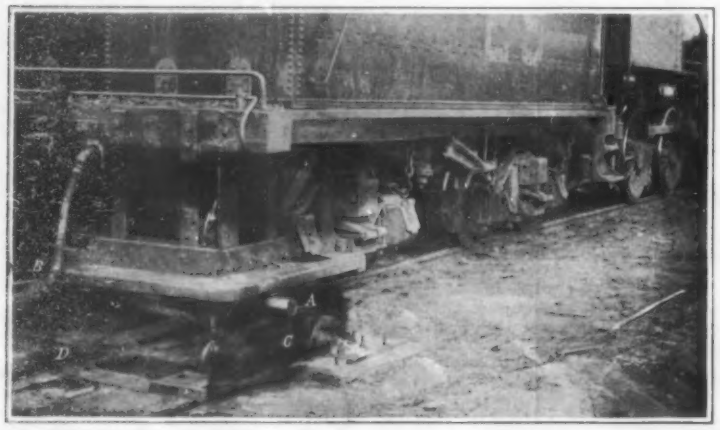


Fig. 1.—The plunger (A) riding on the trip (C) and opening the switch.

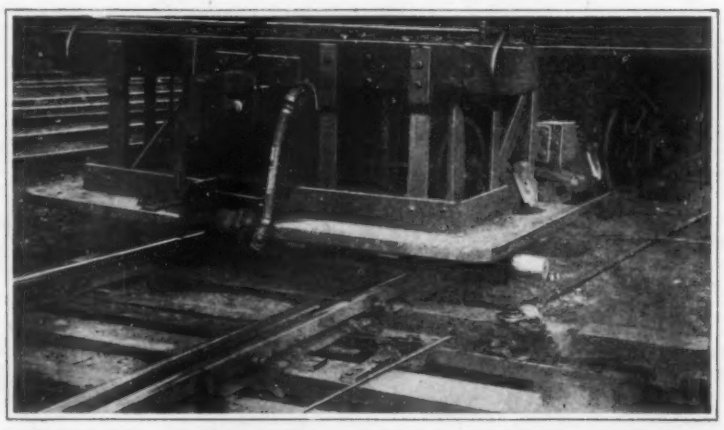


Fig. 2.—The switch held open by the wheels running over the guard.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

BELT BUCKLE.—E. A. GUTHMAN, 39 Bay 29th St., Bensonhurst, Brooklyn, N. Y. The invention provides a buckle having means for attachment to the belt strap to conceal the raw edge and avoid the doubling or loop of common practice; provides a buckle adapted for construction from sheet metal and provided with a bar formed integrally with the buckle frame and arranged to provide a pivot for the buckle tongue; and provides a buckle which will avoid the breaking or creasing of the enamel or finish of fancy leathers.

SHOE HEEL LIFT.—E. E. LOTTIER, 805 Malone St., West Hoboken, N. J. This inventor provides a resilient heel having a non-resilient portion adapted to hold nails or other fastening devices when driven through said heel; provides a means for securing a heel of the character named upon a shoe; and provides a resilient portion for heels, the wearing surface of which has the gripping qualities of rubber and of leather.

SCARF COAT.—ROSABELLE F. COOPER, care of Mrs. Scully, Apt. No. 102, 509 W. 121st St., New York, N. Y. This improvement provides a scarf constructed and arranged to adapt the same for disposition as a coat; provides a garment which may, when removed, be closely folded for packing or for convenience of handling; and provides a wrap garment with stays or fastening devices arranged to compel the garment to assume the characteristics of a fitted garment.

NECK SCARF.—T. DEWEY and F. J. DEWEY, Plattsburg, N. Y. This invention is intended more particularly for embodiment in four-in-hand and like scarfs in the form of a continuous band or strip of a length to constitute a neck band, and to be formed into a knot, leaving depending flaps or ends. It provides means for fastening the ends of the scarf

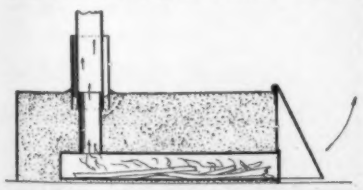


NECK SCARF.

to each other and to a shirt stud or button to hold the ends in proper position. The fastening means are effectively covered and concealed when adjusted, so that the tie has an ordinary appearance. An important object is to provide a fastening attachment which in the tying of the knot of four-in-hands and similar scarfs will in no way interfere with the insertion of the long end or outer flap and its movements through the knot in adjusting the latter.

Of Interest to Farmers.

BROODER OR POULTRY HOUSE HEATER.—G. H. KICHLINE and F. J. STUDER, care of Old Honest Hatchery, New Washington, Ohio. The invention relates more particularly to a heater adapted for use in connection with brooders or brooder houses of other characters, the object being the provision of a sim-

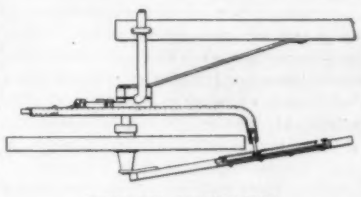


BROODER OR POULTRY HOUSE HEATER.

ple and inexpensive construction and an arrangement whereby to properly radiate the heat and at the same time prevent the fowls and young chicks from direct contact with the heater itself.

INCUBATOR.—R. F. TOOPE, 1 Stepney Square, Stepney, London, E., England. Incubators have generally been constructed of wood which, owing to the apparatus being constantly subjected to high temperatures, becomes exceedingly dry and liable to take fire if exposed to direct contact with the flame or a spark from the heating apparatus. There is also a danger from spontaneous ignition of the structure. The inventor obviates the danger and provides an incubator which is not only incombustible, but exceedingly durable and proof against the attack of vermin, rot, or similar causes of deterioration.

GUARD FOR CULTIVATORS.—J. F. REUSS, address P. O., Chebanse, Ill. This invention is an improvement in guards for cultivators, and has for its object the provision of a mechanism for preventing the corn from being over-run by the wheels of the cultivator during the cultivation after the corn has



GUIDE FOR CULTIVATORS.

reached a certain height, and in cases where stalks have been blown over or where they lean in the row, which may be applied to any ordinary form of cultivator, without essential changes in the cultivator mechanism.

Of General Interest.

DUSTLESS CLOTH.—J. L. SPORER, 38 W. 75th St., Manhattan, N. Y., N. Y. The invention relates generally to a dustless cloth and more particularly it is directed to one especially intended for dusting purposes, the principle of operation involved being new and improved and providing an article especially adapted for sanitary use.

STERILIZING APPARATUS.—J. F. ARMSTRONG, care of L. A. Abrams, 25 Broad St., N. Y., N. Y. This sterilizing apparatus is so constructed and operated as to cause milk to flow along a path of considerable length, and to expose said milk to the action of ultra-violet light rays. It further contemplates the protection of the vapor lamp from injury by contact with the milk in consequence of certain parts of the lamp being heated.

HIGH PRESSURE PIPE HINGE.—F. L. MCGAHAN, Box 1054, Los Angeles, Cal. This inventor seeks among other things of the improvement to provide a type of swivel union in which the two pipe sections, flexibly connected together, may have a maximum freedom of motion and a minimum degree of leakage when subjected to high fluid pressure.

BOOK MARKER.—HELEN S. CARSON, Hyde Park Hotel, Chicago, Ill. This invention is an improvement in book markers, and while the marker is capable of general application and for use wherever it is desirable to use a marker for indicating a page, and a section of such page, the device as presented is especially designed and adapted for use by followers of what is generally known as Christian Science.

BABY JUMPER.—C. R. PATTEN, Tacoma, Ohio. An object of the invention is to provide an inexpensive and durable baby jumper in which the child is so supported as to permit proper exercise of its limbs without danger of its falling out and without requiring the constant attention of an attendant.

FLY TRAP.—J. R. SMITH, Stella, Mo. In this trap the insects will not only be imprisoned, but will be poisoned while therein so that it will not be necessary for a person to collect them subsequently, and whereby insects when dying from the effects of poison will be prevented from dropping and collecting in places causing them to become unsanitary. This device, therefore, combines in one structure the means for not only catching, but collecting the insects.

Hardware and Tools.

CLIPPING TOOL.—W. B. MYERS, Rockledge, Fla. This invention is an improvement in clipping tools such as orange clippers, pruning shears, topping shears and the like, and the object is to provide for disinfecting the wound or cut made by the clipper. Fungous diseases are transmitted by cutting implements, and the device will effectually and automatically prevent contagion.

NUT LOCK.—J. H. WHITE, Thivener, Ohio. In the present patent the invention has reference to the class of nut locks employing a ratcheted washer, in connection with a grooved bolt and a nut, and a dog for engaging the teeth of the washer.

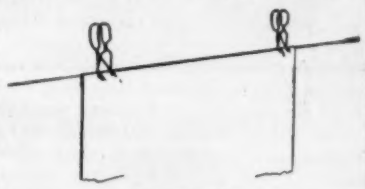
BOLT HOLDER.—J. T. MCCANN, Tuolumne, Cal. This tool is for use in preventing rotation of screw-bolts when nuts are being applied to them. It comprises a frame having a rectangular form, one arm of the same being provided with ratchet teeth, a sleeve adapted to slide on the ratchet members, and a screw supported parallel to the said member and adapted to work in the outer end of an arm which is hinged to the sleeve.

Heating and Lighting.

CAR PRESSURE GOVERNOR.—A. J. SHORT, 435 City road, Edgbaston, Birmingham, England. This governor is of the type in which increase or diminution of gas pressure on a diaphragm causes a valve aperture to be diminished or increased. It is applicable, more especially, to high pressure gas service mains, but may be employed on any gas distributing system.

Household Utilities.

CLOTHES PIN.—H. G. HANSEN and C. H. FROGNER, 4315 Genesee St., Seattle, Wash. The object here is to provide a pin which may be cheaply manufactured, easily placed in posi-



CLOTHES PIN.

tion or removed from the line without the necessity of using more than one hand, which will not tear the clothes either in placing or removing, which does not mar the garments, and which will hold them firmly on the line without any possibility of accidental displacement.

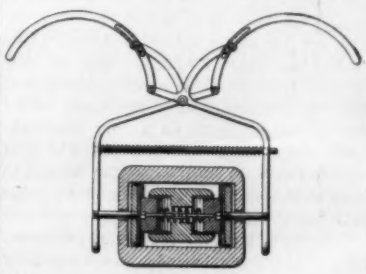
CONVERTIBLE BED AND COUCH.—I. MASON and J. J. MCINTYRE, care of the former, 115 Myrtle Ave., Brooklyn, N. Y. This convertible bed and couch or davenport is arranged to permit of convenient and quick converting of the piece of furniture from a couch to a bed or *vice versa*, the bed and couch being very comfortable and capable of use anywhere in a room, and the couch and its seat being exceedingly soft, pliable and springy, and its back being upholstered.

Railways and Their Accessories.

CAR WHEEL AND AXLE.—J. R. FLEMING, 801 Monroe Ave., Scranton, Pa. The inventor provides means for holding the axle and wheels of a car in non-rotative relation; and provides means for permitting wheels mounted non-rotatively on an axle to slide thereon within a limited area to permit the lateral shift of the wheels to accommodate the adjustment thereof to structural peculiarities of the roadbed.

RAILWAY SWITCH.—J. W. HUBBARD, Eau Claire, Wis. The invention comprises means for operating a switch and locking switch points in their open or closed position. An object is to produce a construction which will prevent derailing and other accidents to trains passing the switch, and for this purpose means are provided which are located in position to be engaged by the wheels of a train approaching the switch, to force the switch points over against the main rail.

CAR COUPLING.—B. ZUCKERMAN, 612 Eleventh Ave., New York, N. Y. This invention relates generally to car couplers and more particularly it is directed to a construction whereby the coupling of the cars is automatically performed, the uncoupling thereof



CAR COUPLING.

being accomplished in a simple manner and in a short time. The principal object is to provide a coupler made up of few parts which, however, are adapted to co-operate with one another in a secure and efficient manner whereby a new and improved structure of this class is provided.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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(12774) C. L. J. writes in reference to query 12747, referring to patent No. 871,994, which furnishes a satisfactory explanation of the reaction involved in cleaning silver by means of the aluminium-silver galvanic couple. By this method the silver to be cleaned is boiled in a solution of table salt and either washing or cooking soda in an aluminium dish or *in contact with* aluminium scraps placed in a granite-ware dish. A galvanic battery is formed, the aluminium serving as anode and the silver as cathode. Nascent hydrogen is evolved on the surface of the silver, and reduces any oxide or other compounds of silver to the metallic state. The soda also cleans grease, etc., from the surface. Instead of removing silver, the net result is substantially one of plating on silver. It is obvious that one should not attempt to clean by this method any silver articles which have been finished with an oxide surface.

(12775) W. M. B. writes: I would like to say to your correspondent in Notes and Queries, G. E. S., No. 12756, that the divining rod will work in my hand. The explanation is very simple, and the rod is of no value in locating water. The whole secret is in the way the stick is held. Get a forked stick with each limb about fifteen inches long, and small enough so as to bend easily. Take a firm hold of both limbs, one in each hand, with the palm up, so the limbs will enter the hand under the little finger and go out under the thumb. Now begin to explore for water. My first experiment was to walk over a water pipe about six feet underground. Just as I passed the pipe the end of the stick rose in the air, came over toward me, and pointed down and back in the direction of the running water, but the pull was too strong to be accounted for by any action of the water. The rough knots would have cut the skin of my hand if I had not loosened my grip. I crossed the pipe repeatedly, always with the same result, until I tried it with my eyes closed, so as not to know when I passed the pipe. In this case it failed to work at all. I also found that when the stick is held in any other way, it will never move. Held in the way directed, the muscles of the hands and arms are in a strained position, and the limbs are bent outward, so that a very slight movement of the ends of the limbs will cause the end of the stick to move a long distance in either direction. The natural efforts of the muscles to relieve the strain, and the automatic action of the mind, account for the working of the rod. A. We have known the explanation which you give of the divining rod. It may be called the theory of mental expectancy. It is probably as good as any theory. Certainly there is no necromancy nor any occult power in water to turn the stick, at least, the scientifically trained man will not believe in such a power.

(12776) F. W. G. asks: 1. According to the laws of gravitation, two bodies, A and B, will attract each other in proportion to the product of their masses, and inversely as the square of the distance between them, if they are small spheres. If a third body, C, is brought into the vicinity, it will attract both A and B, but will in no way affect the mutual attraction already existing between A and B. Is this also the case if A, B and C are very small spheres (in proportion to their distances) having definite electric charges? Or is the mutual attraction and repulsion of electric charges a more complicated affair? Can you recommend any book treating this in detail, preferably without the calculus? A. The law of gravitation is a statement which refers to "particles of matter." Every particle of matter attracts every other particle, etc. Had the molecule been known when this law was formulated, probably that term would have been used in place of particle. Your supposed spheres need not be large. They may be large or small; for what is true of the particles of a body is also true of the attraction of the whole body. The same may be said of electrical charges. 2. Have you any good book treating the electrolytic solution tension theory of metals? A. The electrolytic tension of metals is treated in the books upon physical chemistry. We can supply Van't Hoff's "Theoretical and Physical Chemistry," part I, for $1; part II, for $3. Anything by Van't Hoff upon this subject is authoritative. We can send you H. C. Jones's "Physical Chemistry" for $4. This is also a good text book. 3. Were any prizes or rewards ever offered for the discovery of a method of obtaining power from unorganized, or low-grade, heat energy, as the heat of the atmosphere, or the sea, in defiance of the second law of thermodynamics, as Clerk-Maxwell's "Demon" would be able to do? If so, must it be done on a commercial scale, or are there any other special conditions attached? A. We know of no rewards for the inventing of an apparatus which should circumvent the second law of thermodynamics.



READER'S SERVICE

HARDLY a week passes but the Editor receives letters from readers of the Scientific American who ask him whether they shall send their boys to a technical school. Whether a boy shall become an engineer, a chemist or a naval architect are questions that puzzle parents. The Editor will be pleased to aid readers of the Scientific American in deciding the matter of technical education for their sons.

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The Municipal Need of Technically Trained Men—II

By Rudolph Blankenburg, Mayor of Philadelphia

[IT is the intention of the SCIENTIFIC AMERICAN *to publish a series of monthly articles on the professional opportunities that await the technically trained engineer, physicist, chemist, bacteriologist and technologist in modern life. Last year, it will be remembered, a series of articles was published written for the most part by well-known educators connected with our leading technological institutions. They showed how institutes of technology were endeavoring to meet the requirements of great manufacturing railway and municipal corporations. This year's series, written by the heads of great corporations and cities—organizations which are capitalized at millions of dollars, which employ thousands of men, and which are scientifically managed—will show how great is the need of trained chemists and engineers. The following article, written by the Mayor of Philadelphia, shows the need of technically trained men in carrying on the business of a great municipality.*—EDITOR.]

Municipal engineering began in Philadelphia with an official who was known as a "Regulator." His principal function seems to have been to see that the rain water running off of Dietrich Hydrocrimper's lawn followed the proper course, and did not unduly disturb his neighbors. All questions affecting water courses and the laying out of roads were left to this official. He worked practically without instruments.

After a while, the demands for improvements and supervision were such as required more technical knowledge and some few instruments were introduced and used: thus the "Surveyor" made his bow. From those days to this, the problems of municipal administration have been multiplying and with them increased the number of experts. It would be very interesting to list the experts of different kinds now in the employ of the city of Philadelphia. We have undoubtedly over a hundred different kinds of technically trained and educated men whose knowledge of their subject has become sufficiently extended to be considered scientific.

During the past generation or two, it seems to have been one of the fallacious contentions of democracy, as we have applied it in this country, that if you can get enough different people to consider and try to solve a given subject, you are then pretty sure to get a wise decision. In fact, at times and especially in some localities, the thought has been encouraged that the larger the number of people who discuss a subject the more apt you are to get a sound decision. This false idea, applied almost with the passion of religion to municipal administration by designing men, has held it for ten or twenty years on a very low technical and administrative level. The idea was fostered by politicians who wished to keep possession of the municipal reins and purse strings for their own selfish ends. They tried to teach the electorate that, if anybody who really knew anything about a municipal subject was called in to act, their liberties were threatened in some mysterious way. But with the tremendous increase in the size of our city and the rapidly growing percentage of our population that lives within metropolitan areas, the game has gotten too fast for a mere playground. Even the ablest and most unscrupulous of our politicians and those who are holding on tightest to their political control are today calling in the experts and leaning on technically trained and educated men.

Probably the first notable example of this was in the development of the New York city water supply. For over twenty years that municipality has taken the position that the water supply, first of Manhattan and later for Greater New York, was too serious a matter to be made the football of politics, and almost from the start this work has been in the hands of able men and practically free from political domination. The water supplies, however, for centuries, even in ancient Rome, have been considered proper subjects for engineering schools.

The present period is remarkable in that we are beginning to look upon practically everything that is done by the municipality as an engineering or scientific problem, as we are approaching everything from a standpoint of laboratory rather than thumb rule. Take street cleaning, for instance; there is rapidly being developed a formidable literature on the subject. More and more complicated and efficient street cleaning machines are being built. The hand paraphernalia is being studied in order to make it easy to get the best results, and an enormous amount of work has been done on cost data. The control of this work has been studied both here and in Europe so as to be able to make the money expended give the best possible results. This was formerly considered a matter that was beyond the province of science or technical knowledge.

After having said all this, it is fair to add that if you ask any street cleaning expert whether any part of our present methods will be retained in the street cleaning scheme of a few years hence, he will surely reply "No." In other words, everything that we are doing to-day is so far from satisfactory that it is bound to disappear and to be supplanted by a system the detailed methods of which we know but little to-day.

Another striking instance of our present day attitude is in the matter of selection of laborers. Four years ago if anybody had suggested that high-class physicians and other technical experts should be called to help solve this question they would have been laughed at. A laborer was supposed to be somebody who was just "a laborer" and no one asked any further questions. The other day, in Philadelphia, out of 450 men examined for laborers, perhaps two thirds were rejected by the doctors and others who examined them, and rejected for perfectly obvious reasons. A great many of them were suffering from hernia and other maladies which clearly showed their physical disabilities for heavy laboring. At the present time the tests that these men are being subjected to are largely physical, but now everybody admits that there are tests beyond these that must be developed if the city is to be a model employer. We must be able to determine what the chairman of the Civil Service Commission has aptly designated a man's "singing qualities:" that is, the relative amount of joy he has in his work. A man who loves his work, no matter in what occupation, will do good work.

Street lighting is just beginning to take its place as a subject for scientific inquiry on the part of municipalities. Private corporations have been collecting an enormous amount of technical data, covering at least a part of this field, but up to within the last two or three years, cities themselves have had no technical data that could be depended upon. In this field the demand has come about through the various city and State Public Service Commissions. These commissions have inquired into the technical aspects of the work carried on by different public service corporations, and they have forced both city and State to employ men competent to compete technically with those in private employ.

Sewage disposal represents an entirely different class of municipal problem, requiring scientific attack, in that it is brand new. The best of these methods come from Germany, and they are the development of the last few years. The sewage disposal method which obtains over the greater part of Europe is now absolutely obsolete. Most American cities have not begun the study of sewage disposal problems.

In the past cities have had too small a number of officials with large salaries and

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too large a number of laborers at low compensation. The tendency has been to have too many employees at medium wage; the consequence is that the best men have gone to other employers. If the city is going to place itself in the position where it can compete technically, it must learn that men with technical skill and training are commanding increasingly high salaries in private or corporate employ, and we must be ready to meet them or lose their services. At the same time, it must learn to do the lowest grade of work with men well qualified for it and paid more than they are paid by private enterprises.

A further evidence of the interest that is being taken by technically trained men in municipal work is that a number of the different colleges are now extending courses not only in municipal administration, but in municipal engineering. The number and scope of these courses are increasing very rapidly.

Efficiency in municipal government becomes more and more dependent upon men of thorough engineering and scientific training. Let the cities of our country vie with one another in taking the first rank in the advance line of thought and performance.

The Cleveland Chamber of Commerce and the Oldfield Bill

[SOON after the introduction of the Oldfield Bill the directors of the Cleveland Chamber of Commerce appointed a committee on Patent Laws and Administration for the purpose of studying the operation of the present patent system and of determining the effect of the Oldfield Bill, if enacted into law, upon that system and the vast manufacturing interests of this country. The report of that committee is important because it reflects the best opinion of one of the richest manufacturing districts in this country. Unfortunately it is too voluminous for complete reproduction here. Therefore those portions have been omitted dealing with phases of compulsory license and the attempt to make the patentee amenable to the Sherman Law, with which our readers are already familiar, as the result of editorial discussion in the SCIENTIFIC AMERICAN. Attention should also be directed to an excellent essay by Mr. Jesse Fay, appearing in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, in which the benefits to be derived from a liberal patent system are pointed out and the difference between the patent monopoly and other monopolies clearly indicated. Mr. Fay's work constitutes an appendix to the following report; and should be read in connection with it.—EDITOR.]

Your committee definitely recommends that the influence and power of the Cleveland Chamber of Commerce be exercised: (1) to secure the defeat of H. R. 23,417—the Oldfield Bill; and (2) to bring about congressional or executive action to secure immediate, competent and concentrated inquiry under national auspices, designed to lead to a recommendation and ultimate action by the proper authority upon the changes, if any, in patent or other law, Patent Office procedure and court procedure necessary to restore to an American patent under our existing complex industrial conditions and the relatively great dissemination of technical knowledge, the commercial status it enjoyed under the simpler and scientifically and technically more ignorant period immediately succeeding the passage of the law of 1836; and (3) to enlist the assistance of other chambers of commerce and other interested bodies to the above ends.

There have been introduced during the present Congress seventy-five bills relating to this subject, but not one treats it comprehensively and very few attempt to correct the abuses hereinafter cited, or increase the effectiveness of the patent system. In fact, many of the bills seem to have been designed, in effect, to destroy the patent system altogether.

Up-to-date the only bill of a general character reported by the House Commit-

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Friction steals mileage that belongs to you. In time its constant rub—rub—rub wears out every motor.

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Every year hundreds of thousands of automobiles go over the road—lubricated—yes, but lubricated badly. Generally these motorists will say that their cars "seem to be working all right." But unnecessary friction is at work.

Its common results are:

(1) **Undue loss of power.**
(2) **Unnecessary repair troubles.**
(3) **An excess consumption of fuel.**
(4) **An excess consumption of lubricating oil.**

These losses are traceable to one common cause—careless and improper lubrication.

Any oil will lubricate to an extent. So will lard. But a lubricating oil, to have efficient lubricating qualities, must both wear well in use, and furnish proper protection under the heat of service.

Such oils are rare.

Given an oil with these qualities, (and remember they are rare), you must next make sure that the oil's "body," or thickness, meets the feed requirements of your motor.

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Based on this motor-analysis and on practical experience, we have specified in a lubricating chart (printed in part on the right) the correct grade of Gargoyle Mobiloil for each make of automobile.

The superior efficiency of these oils has been thoroughly proven by practical tests.

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A booklet, containing our complete lubricating chart and points on lubrication, will be mailed on request.

—

These are the facts.

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Explanation: In the schedule, the letter opposite the car indicates the grade of Gargoyle Mobiloil that should be used. For example: "A" means "Gargoyle Mobiloil A." "Arc." means "Gargoyle Mobiloil Arctic." For all electric vehicles use Gargoyle Mobiloil A. The recommendations cover both pleasure and commercial vehicles unless otherwise noted.

MODEL OF CARS	1909		1910		1911		1912		1913	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Abbott Detroit			A	Arc.	A	Arc.	A	Arc.	A	Arc.
Alco	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
American	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Apperson	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Autocar (2 cyl.)	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
" (4 cyl.)	A	E	A	E	A	Arc.	A	Arc.		
Avery			A	E	A	E	A	A	A	A
Benz	A	A	A	A	A	A	A	A	A	A
Buick (2 cyl.)	A	A	A	A	A	A	A	A	A	A
" (4 cyl.)	A	Arc.	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
Cadillac (1 cyl.)	B	A								
" (4 cyl.)	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Cartercar	A	A	E	E	A	E	A	E	A	E
" Com'l.	A	A	A	E	A	Arc.	A	Arc.	A	Arc.
Case					A	A	A	Arc.	A	Arc.
Chalmers	Arc.	Arc.	Arc.	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.
Chase	B	B	B	B	B	B	B	B	B	B
Cole			A	Arc.	A	Arc.	A	Arc.	Arc.	Arc.
Columbia	A	E	E	E	A	A	A	A		
" "Knight"							A	A	A	A
Couple Gear	A	A	A	A	A	A	A	Arc.	A	Arc.
Daimler	A	E	A	E	A	E	A	A	A	A
" "Knight"							A	A	A	A
Darmcq	A	E	A	E	A	E	Arc.	Arc.	Arc.	Arc.
De Dion	B	A	B	E	B	A	B	A	B	A
Delaunay-Belleville	B	A	B	A	B	A	B	A	B	A
Elmore	A	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.		
E. M. F.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.		
Fiat	B	A	A	A	B	A	A	B	A	
Flanders			E	E	E	E	Arc.	Arc.		
" (6 cyl.)									Arc.	Arc.
Ford	E	E	A	Arc.	E	E	E	E	E	E
Franklin	B	E	B	Arc.	A	Arc.	A	Arc.	A	Arc.
" Com'l.	B	A	E	A	B	A	A	Arc.	A	Arc.
G. M. C.							Arc.	Arc.	A	Arc.
Grant					A	Arc.	A	Arc.	A	Arc.
Grant-Logan	A	Arc.	A	Arc.						
Herreshoff	A	A	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
Hewitt (2 cyl.)	A	A	A	A	A	Arc.				
" (4 cyl.)	A	E	A	E	A	Arc.	E	E	E	E
Hudson			Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
Hupmobile "20"	Arc.	Arc.	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
" "32"									A	Arc.
I. H. C. (air)									D	A
" (water)									A	A
International	B	A	B	A	B	B	B	A		
Interstate	A	E	A	E	A	Arc.	A	Arc.	A	Arc.
Isotta	A	A	A	A	A	A	A	A	A	A
Italia	A	A	A	A	A	A	A	A	A	A
Jackson (2 cyl.)	A	A	A	A						
" (4 cyl.)	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Kelly					Arc.	Arc.	Arc.	Arc.		
Kelly Springfield									Arc.	Arc.
Lassel-Kar	A	E	A	E	A	Arc.	A	Arc.	A	Arc.
" Com'l.					Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Kline Kar			Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Knox	B	A	D	A	D	A	B	A	D	A
Krit			A	A	A	A	A	A	A	A
Lancia	B	A	B	A	B	B	B	Arc.	B	Arc.
Locomobile	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Lozier	A	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Mack	A	E	A	A	E	E	E	E	E	E
Marion	A	E	A	E	A	E	A	Arc.	A	Arc.
Marmon	Arc.	Arc.	A	E	A	Arc.	A	Arc.	A	Arc.
Matheson	Arc.	Arc.	Arc.	Arc.	A	A	A	Arc.	A	Arc.
Maxwell (2 cyl.)	E	E	E	E	E	E	A	A		
" (4 cyl.)	E	E	E	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
" (6 cyl.)									Arc.	Arc.
Mercedes	A	E	A	E	A	E	A	E	A	E
" "Knight"					A	A	A	A	A	A
Mercer			A	Arc.	A	Arc.	A	Arc.	A	Arc.
Michigan			Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
Minerva "Knight"					A	A	A	A	A	A
Mitchell	A	A	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
Moon	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
National	A	Arc.	A	A	A	A	A	A	A	A
Oakland	A	E	A	E	A	Arc.	A	Arc.	A	Arc.
Oldsmobile	A	E	A	E	A	Arc.	A	Arc.	Arc.	Arc.
Overland	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Packard	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Paige Detroit			E	E	A	Arc.	A	E	A	E
Panhard	A	E	A	E	A	E	A	Arc.	A	Arc.
" "Knight"					A	A	A	A	A	A
Pathfinder									A	Arc.
Peerless	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Pierce Arrow	A	Arc.	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
" Com'l.			Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Pope Hartford	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Premier	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Pullman	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Rambler	A	A	A	A	A	Arc.	Arc.	Arc.	Arc.	Arc.
Rapid	A	A	A	A	A	Arc.	Arc.	Arc.		
Rayfield									A	A
Regal	A	E	A	E	A	Arc.	Arc.	Arc.	Arc.	Arc.
Renault	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Reo	A	A	A	E	A	Arc.	A	Arc.	A	Arc.
S. G. V.					B	Arc.	B	Arc.	B	Arc.
Selden	A	E	A	E	A	E	Arc.	Arc.	Arc.	Arc.
Service					A	A	A	A	A	A
Simplex	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Speedwell	A	Arc.	Arc.	Arc.	A	Arc.	A	Arc.	Arc.	Arc.
" "Mond"									A	Arc.
Stanley	D	D	D	D	D	D	D	D	D	D
Stearns	A	A	Arc.	Arc.	A	Arc.	A	Arc.		
" "Knight"							A	A	A	A
Stevens Duryea	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Stoddard-Dayton	E	E	Arc.	Arc.	A	Arc.	A	Arc.	A	A
" "Knight"							A	A	A	A
Studebaker	A	E	E	E	A	Arc.	Arc.	Arc.	A	Arc.
Stute							Arc.	Arc.	Arc.	Arc.
Thomas	E	E	E	E	E	E	A	S		
Walter	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Warren Detroit			Arc.	Arc.	A	A	A	A	Arc.	Arc.
White (Gas)			Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
" (Steam)	D	D	D	D	D	D	D	D	D	D
Winton	E	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.



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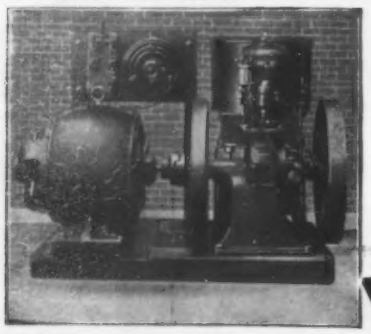


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tee on Patents is H. R. 23,417, colloquially known as the "Oldfield Bill," which, except for a few provisions of minor consequence, does not even profess to deal with questions hereinbefore set forth as agitating those familiar with our patent system, except in its supposed relation to the question of industrial monopolies.

Whatever view may be entertained of the community-injury inherent in industrial monopolies, a proper understanding of the true nature of "patent-monopoly" tends to exclude the latter wholly, or almost wholly, from any imputation of the kind. It is, in fact, more than doubtful if when the community benefit flowing from the invention is considered, the algebraic sum of the benefits and injuries which are sustained by the community from any of the existing alleged abuses arising from patent monopoly is not decidedly in favor of the community. An understanding of the true nature of patent monopoly as distinguished from industrial monopoly is so essential to a proper judgment of the entire subject that we attach hereto, marked "A," a copy of a paper read by Mr. J. B. Fay of this city in December, 1912,[1] which contains the clearest statement of this fundamental distinction which we have seen, and it should be carefully read and kept in mind in considering the various natural subdivisions of this question.

In connection with this subject, we also commend the reader to the somewhat less consistent, but nevertheless highly interesting abstract published on page 46 of the SCIENTIFIC AMERICAN SUPPLEMENT of January 18th, 1913, from the late Prof. N. S. Shaler's book on "The Nature of Intellectual Property."

It is a significant fact that the better the subject is understood, the less tendency there is to interfere with a patent owner's scope of action, or to fear the effect of power arising from patents. And the present sub-committee of the House of Representatives gives encouraging evidence of its intellectual honesty by being no exception to this rule. (See page 6 et seq. of a pamphlet entitled "Revision of Patent Laws," published by the Patent Law Association of Washington, D. C.)

Abuses will undoubtedly arise under any law, but it remains to be demonstrated that a limited patent monopoly of the nature contemplated by the United States Constitution and our present patent law will materially interfere with the effect of any general law in restraint of industrial monopoly or in regulation of large industrial organizations when backed by public opinion. The whole subject of the regulation of great industrial organizations and restraint of monopolies is now undergoing the most active discussion before Congress and the public, and no one would be more incompetent to predict the survivor of the many views presented and yet to be presented, and measures proposed and yet to be proposed, as he who thinks he can do it.

Instead, therefore, of enacting a law like the Oldfield Bill, fundamentally impairing the value of the United States patent inherent in the intent of the patent law, and tending to discourage financial investment in that development of invention which has played, and the great majority believe is yet to play, one of the foremost parts in the progress of our civilization, it would seem to be the better statesmanship to defer the attempt to harmonize our patent laws with the public attitude toward the regulation of monopolies, until we have found out what the latter is to be, and have had an opportunity to observe the effect thereon of the limited patent monopoly as contemplated by our present laws and to avoid injurious general legislation enacted for the purpose of protecting society against the effects of the "rare exception."

In the place of such destructive legislation there is ample room for the constructive kind. It is now over thirty-five years since the inadequacy of our Patent Office organization received official recognition, and its effect upon the pre-

[1] Published in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT.—EDITOR.

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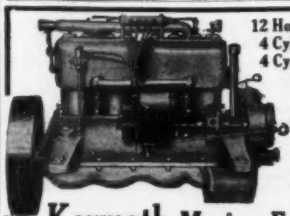
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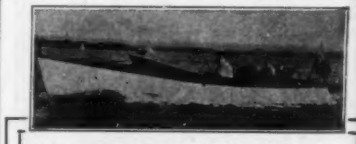


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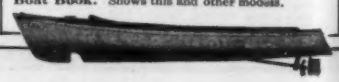
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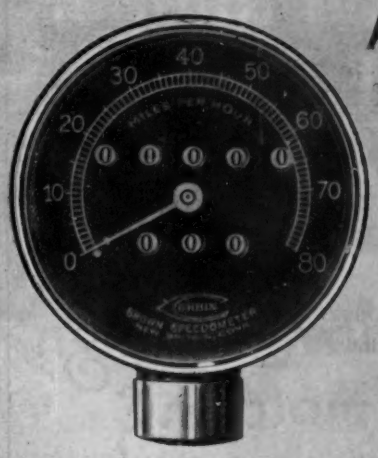
sumptive validity and consequent commercial value of a patent was pointed out. It is now over twenty years since many manufacturers, attorneys and inventors, and others directly interested in, or well informed in regard to patents, began to believe that the increasing variety and correlation of the arts and consequent difficulties of classification, together with the difference between the actual and recorded states of the several arts, had passed the point at which any practicable form of organization could assure to an issued patent the degree of presumptive validity contemplated by the law of 1836, at least until the basis of patent validity, as gradually developed in the Patent Office and recognized by the public, is modified to emphasize the distinction between successive inventions in the same art and between them and the actual state of the art.

But this presumptive validity of the early American patent constituted, and it is hoped can yet again be made to constitute the chief virtue of the system, and the security which it afforded to a developing investor has been probably the greatest single human factor in the extraordinary industrial, and of late agricultural development of the country, and the consequent benefits which that development has brought, and has put us in a position to continue to bring, to the entire community.

In proportion as the presumptive validity of patents has grown more and more doubtful, patent property has become correspondingly more and more the object of speculation. Those engaged in legitimate industry are finding very few patents of which they can estimate the commercial value by any method short of appeal to the courts, and in the great majority of cases are unable to say whether or not patents called to their attention have any value at all, or are, in fact, valid in any particular. In the period during which the full recognition of this situation was limited to comparatively few people, speculative organizations naturally sprang up for no other purpose than to make use of the large number of doubtfully valid patents for the purpose of collecting from those engaged in the arts concerned, royalties carefully fixed at figures which the intended licensees could reasonably be expected to pay, rather than embark upon expensive and tedious litigations, with doubtful outcome.

The pressure upon examiners and upon the Patent Office organization generally, is almost altogether in the direction of granting rather than refusing patents on pending applications. This has naturally accentuated the tendency to issue patents of doubtful validity and trivial novelty or those so slightly, if at all, in advance of "the highest skill of the calling" as to be overtaken by the ordinary progress of the art almost immediately after issue. It has sometimes been inferred from this that it lies within the province and power of the Commissioner of Patents to relieve our difficulties by administrative reforms, such, for example, as to limit the scope of patentability to inventions definitely in advance of "the highest skill of the calling" and likely to remain so long enough after date of issue to permit the progress of the art involved to benefit enough by the disclosure and expected development of the invention to make it to the public advantage to grant in return therefor, the limited monopoly now legally provided for.

The Commissioner probably has the *legal* right to effect such reforms, but "it is not to be expected that the Commissioner of Patents can make a radical change in such practice and establish, and effectively enforce, rules which are objectionable for various reasons to a large number of persons having business within the office. . . . Briefly stated, simplification of methods by positive requirement of law, both as to the general patentability and the administrative procedure, is what is needed." (Quotation from page 16, "Report of the Investigation of the United States Patent Office, made by the President's Commission on



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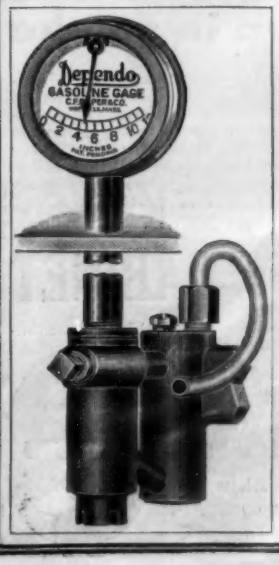
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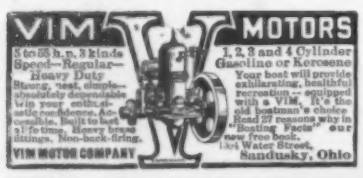
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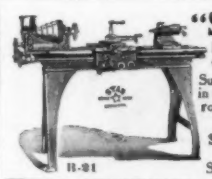
The preparation of the document just quoted was made possible by the action of our own Congressman, Hon. Robert J. Bulkley, in introducing after suitable action in committee, joint resolution No. 337, authorizing and making preparation for the required investigation leading to the report.

Again quoting from this thorough, comprehensive and intelligent report: "The question of the desirability of decreasing the number of patents granted for what are called trivial inventions, so that the patents granted by the United States shall be only for inventions, or improvements that are of value . . . is closely related to the subject of this chapter and the remedy, if one is needed, is to be found in the perfecting of the methods of examination, and in a change of law to give specific authority for refusing patents in such cases."

But even if these objections to the practicability or adequacy of administrative action on the part of the Commissioner are insufficient, such administrative action cannot extend itself to the harmonization of Patent Office procedure with the subsequent procedure in the federal courts in case of litigation. It is evident, however, that any change in the character of the Patent Office organization and its legal functions will be likely to affect the degree and character of patent litigation, and, therefore, affect the question of the most efficient method of court organization and procedure, and that the tasks of both Patent Office and the federal courts will in turn be likely to be affected by any new legislation affecting the scope of patentability, the number of patents issued, or their commercial value, and those tasks, present and prospective, must determine the nature of the organizations most suited to their economical accomplishment. To modify one without modifying the other in harmony with it entails inefficiency and waste. The efficiency of our patent system, that is, the extent to which it realizes the purpose for which it was created, depends upon Patent Office procedure, federal court procedure in subsequent litigation, and the relation of the two to each other, and these in turn are determined by law of Congress. To consider one without the other simply invites ultimate confusion. This seems to be the inevitable goal of a thorough consideration of the subject. The President of the United States, in a message to the Sixty-second Congress, Second Session (H. R. Document 749), on May 20th, 1912, asked for authority "to appoint a commission to investigate the present state of the patent law and to report what, if any, changes, or amendments should be made, to conform that law with modern conditions and requirements."

We are not aware that any legislative action to that end has resulted, unless H. J. R. 337, already referred to, and limited *exclusively* to an investigation of the *administration* of the Patent Office, be considered a preliminary contribution to the desired end, as no doubt it can. We are not aware that any serious, comprehensive, official attempt is now being made to consider the several departments of this subject *together*, and to determine what, if any, legislation is necessary to remove from our patent system, including court procedure, the objections above cited, and reduce every law and process relating to patent grants, or litigation, to the simplest, most effective and most properly correlative form.

It is the opinion of your committee that instead of the present apparent tendency to consider piecemeal the functions of our patent system by committees whose members are actively engaged also in the consideration of other equally important, if not equally detailed questions, the whole question of harmonizing the existing patent law, administration and court procedure with the present state of society and the arts, should be submitted to some properly constituted body under condi-



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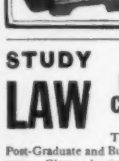
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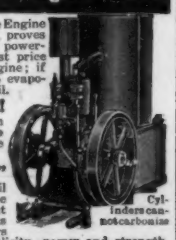
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tions which will permit the concentration of effort solely on this subject until recommendation is forthcoming upon which a congressional committee can base its subsequent action.

Much public discussion of this subject takes the position of, or gives the impression that the inventor or patent owner is the principal beneficiary of the patent law, which it is made to appear was devised under a constitutional provision peculiar and differing from all the rest in being designed, not for the ultimate benefit of the community, but for the benefit of a single class therein—the inventor; for whose interests the fathers of our country were especially concerned to the prejudice of the interests for the benefits of which the Constitution was framed. Such a conception is refuted by its mere statement.

It is for their *own* benefit that the people grant to the inventor a limited monopoly in return for his *disclosure* of his invention, and in order to afford developing investors reasonable security and inducement to make the necessary investment. The force of this statement "goes home" when one considers that a blast furnace for making pig-iron in its commercial form, costs a matter of $1,000,000; that every iron article "starts" in the blast furnace, and that somebody with the funds had to develop it. Similar instances could be multiplied. As a matter of fact there is no element of the community that the fundamental intent of our patent law would not benefit if carried out by adaptation to present conditions, and even in its present form it is a benefit to the community at large.

Respectfully submitted,

COMMITTEE ON PATENT LAWS AND ADMINISTRATION,
By HAYDEN EAMES, *Chairman.*

The "Disintoxication" of Tobacco

FOR many years Dr. Parant of Lono-le-Saunier has been working on the fascinating problem of how to enjoy the delights of a good smoke without the ill effects hitherto considered inevitable. Some two years ago he invented pipes and cigar or cigarette holders in which the smoke was obliged to traverse surfaces of considerable extent before reaching the mouth of the smoker, thereby losing perforce a large part of its toxic elements by condensation. This device, used unfailingly and regularly cleaned with care, greatly diminishes the amount of nicotine and other deleterious elements which can reach the mouth.

Now, according to the *Journal des Debats*, Dr. Parant has gone a step further in first aid to the smoker. His new method consists in the utilization of the catalytic properties of certain elements, especially aluminium. The tobacco is moistened with an aluminium solution, is allowed to dry, and is then smoked.

What happens? Parant's theory is that, thanks to the elevation of temperature, the aluminium which has remained fixed upon the tobacco after the evaporation, forms with the nicotine a highly instable aluminate of nicotine, which breaks up almost as soon as formed into the inoffensive substances, carbon dioxide, nitrogen, and water vapor.

According to his experiments the smoke loses from 50 to 60 per cent of its normal toxic content—on the condition always, which seems to be indispensable, that the tobacco, on leaving the aluminium solution, should be dried at rather high temperature of 70 to 80 deg. Cent. When dried at a lower degree the destruction of toxic elements by combustion is much less complete.

Parant's method of procedure is very simple. In the case of tobacco it is merely moistened with the proper solution. For cigars it is better to inject the solution by means of a syringe and then dry them at slightly elevated temperature on a porcelain stove or by similar means, in order to eliminate the acetic acid employed to dissolve the aluminium in the catalytic solution.



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Keep moving—when competition gets there, you'll be somewhere else—farther ahead.

But that means getting ideas into action, and doing it quick.

You've got to use letters, you've got to use printed matter to reach the men you want to sell.

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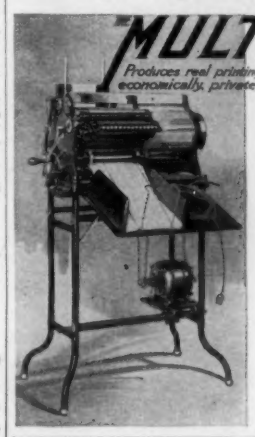
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The 1913 models of the Indian Motocycle are as complete and satisfying as the most exacting rider could demand. The prime essentials of Power, Speed, Flexibility, Comfort, Reliability and Ease of Control are positively superb in each instance. No less than eleven improvements this year. Twenty-nine minor "refinements" in addition. Most important new features are those providing absolute riding comfort. No jolting—no vibration.

The Cradle Spring Frame

is the greatest of all improvements. Riding on the Indian is like riding on air, so smooth is its running. There's no strain on the nervous system and no unnecessary jarring of the machine and fittings. The "life" of the motorcycle is greatly increased.

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Any speed from 4 to 50 miles an hour. Free Engine Clutch gives the Indian a thousand speeds. Motor has reserve power that takes you up any hill. Wonderfully economical motorcycle to maintain. No "extras" on the 1913 models. No increase in prices.

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Set-in Dash Lights
Left-side Drive
Simple Center Control

Oversize Tires
15 Roller Bearings
50% Overcapacity
No Levers in the Way

By R. E. Olds, Designer

Here are some things which cars must have to be really up-to-date.

These are the things which you'll miss most if you fail to get them.

Note that Reo the Fifth combines them all, and combines them in an honest car.

Coming Features

Most leading cars now have left-side drive. Note that fact carefully. The driver sits close to the car he passes, as in European cars.

All leading cars now have set-in dash lights, to displace the old side oil lamps.

Leading cars now employ big tires. They are costly, but the day of skimpy tires is over. They cost too much for upkeep.

Mark these facts, whatever car you buy. Don't buy a car already out-of-date. What leading cars do this year, most cars must do next.

Greater Care

Then leaders now are building cars with immensely greater care. They have seen that cars built otherwise don't live.

This means Timken bearings instead of common ball bearings. Not merely a couple to claim their use, but roller bearings throughout.

It means drop forgings in place of steel castings, to avoid the risk of flaws. In Reo the Fifth we use 190.

It means steel made to formula, and analyzed twice. It means gears tested for 75,000 pounds per tooth.

It means big margin of safety. Driving parts made one-half stronger than necessary.

It means a $75 magneto—

A doubly-heated carburetor—

Big brakes—big springs, tested for 100,000 vibrations.

Every Precaution

The leading makers employ every precaution. Every part is compelled to pass radical tests and inspections.

Important parts are hand-fitted, and ground over and over to get utter exactness. Modern, costly machines are used in the gear cutting.

Engines are given five long-continued tests, and the tested engines are taken apart and inspected.

Genuine leather and the best curled hair are used in upholstery, so the car won't soon look old.

Nothing is ever rushed.

Insist on Them

This is the practice in costly cars. That's what makes them costly. But no man in these days should at any price buy a car without them.

What pride can one take in a car with features distinctly out-of-date? What satisfaction is there in a car that's poorly built?

Soon troubles begin—soon repairs begin. And the cost of upkeep makes the car a burden.

In each Reo the Fifth we spend $200 in features and cautions which some call unnecessary.

We save it in factory efficiency. By confining our output to only one model we save about 20 per cent. That's why a car, built as we build it, can be sold at the Reo price.

It means to you a long-lived car—a car that keeps its newness. It means a car distinctly up-to-date.

One wrongs himself if he lets any inducement sell him a lesser car.

The Simple Rod Control

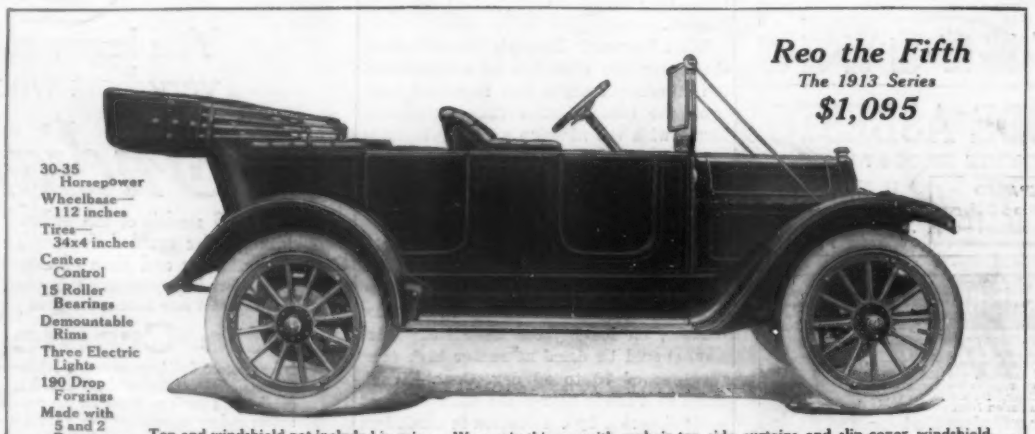
Reo the Fifth has no levers, side or center. Nothing on either side blocks the way of the driver. He is never compelled to dismount in the street, nor enter from the street.

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This is also a coming feature. You will see why it must be. It is one you should have on a new car.

A thousand dealers handle Reo the Fifth. Write for our 1913 catalog and we will tell you where to see the car.



Reo the Fifth
The 1913 Series
$1,095

30-35 Horsepower
Wheelbase—112 inches
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Center Control
15 Roller Bearings
Demountable Rims
Three Electric Lights
190 Drop Forgings
Made with 5 and 2 Passenger Bodies

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